

kilobaud^{T.M.} MICROCOMPUTING



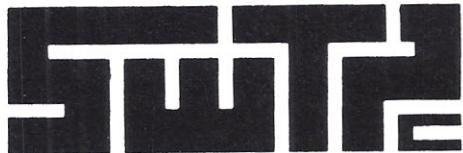
22 An Editor for 6800 BASIC Programs.....	Peter A. Stark
28 u-Panel for KIM.....	George E. Lang
32 Rolling Dice.....	Rod Hallen
34 Pseudo Graphics.....	P. Feldman, T. Rugg
40 The BCS and Its President.....	D. Brisson, J. Barry
44 Address List Editor.....	S. Wantz, B. Bateman
53 Display Your PET!.....	Don Ketchum
54 TRS-80 Tape Controller.....	Frank B. Rowlett, Jr.
58 SHHH—People Are Sleeping.....	Charles R. Carpenter
64 Say It with a Banner.....	Philip Tubb
72 Open House.....	Richard J. Nitto
78 Cassette Interfacing.....	D. Jenkins, J. McCauley
82 PET Techniques Explained.....	Gregory Yob
88 A Service Bureau for Hobbyists.....	Peter A. Stark
94 Little Bits.....	Deibert, Brunelli, Brennan, Wright
102 Keeping Ma Bell Happy.....	Russell E. Adams



Someday all terminals will be smart.....

- ◆ 128 Functions—software controlled
- ◆ 7 x 12 matrix, upper/lower case letters
- ◆ 50 to 38,400 baud—selectable
- ◆ 82 x 16 or 92 x 22 format—plus graphics
- ◆ Printer output port
- ◆ "CHERRY" keyboard

CT-82 Intelligent Terminal, assembled and tested. \$795.00 ppd in Cont. U.S.



SOUTHWEST TECHNICAL PRODUCTS CORPORATION
219 W. RAPSODY
SAN ANTONIO, TEXAS 78216

AMERICAN DATA INTRODUCES

OHIO SCIENTIFIC

PRODUCTS TO EUROPE.

CONTACT YOUR NEAREST DEALER.

BELGIUM

International Electronic Center
Avenue Charles Plisnier, 37
B 1070 Brussels
Telephone: 02/521-9580

UNITED KINGDOM

Abacus Computers, Ltd.
62 New Cavendish Street
London W1
Telephone: 01/580-8841

Linn Products
235 Drakemire Drive
Castlemilk Glasgow
G45 95Z Scotland

Mutek
Quarry Hill
Box Corsham
Wiltshire SN14 9HT
Telephone: 09/574-3289

U Microcomputers
PO Box 24
Northwich, Cheshire CW8 1RS
Telephone: 06/067-5627

FRANCE

Computer Shop Janal
12 Rue Pasquier
75008 Paris, Lyon, Tours
Telephone: 329-6237
Telex: 203919

Electronic JL
97 Rue des Chantiers
78000 Versailles
Telephone: 950-2820
Telex: 260717

GERMANY

BISY
Rheinstrasse 2
4040 Neuss 1
Telephone: 02/101-28124
Telex: 8517931

MCDS
Luisenplatz 4
D 61 Darmstadt
Telephone: 06/151-20302

Balue Electronic
Burchardplatz 1 (Chilehaus)
2000 Hamburg 1
Telephone: 33-0935
Telex: 216-1373

GREECE

Compumak, Ltd.
117 Solonas Street
Athens 142
Telephone: 363-2952

ITALY

Edi Consult SRL
Via Caccini 12
Monza
Telephone: 03/938-9850

Skylab
Via M Gioia 66
20125 Milano
Telephone: 02/688-3806

NETHERLANDS

Koopmans
Joh. Vermeerstraat 7
3351 BN Papendrecht
Telephone: 07/856-033

*AMERICAN
DATA-HOME AND OFFICE COMPUTER*

1030—15TH STREET, N.W., SUITE 300
WASHINGTON, D.C. 20005
(202) 466-6612
CABLE ADDRESS—"AD HOC"
TELEX: 64405

150 REGENT STREET, SUITE 500
CHESHAM HOUSE
LONDON W1R 5FA
TELEPHONE: 01/439-6288
TELEX: 261426

✓ A74

The Age of Affordable Personal Computing Has Finally Arrived.

Ohio Scientific has made a major breakthrough in small computer technology which dramatically reduces the cost of personal computers. By use of custom LSI micro circuits, we have managed to put a complete ultra high performance computer and all necessary interfaces, including the keyboard and power supply, on a single printed circuit board. This new computer actually has more features and higher performance than some home or personal computers that are selling today for up to \$2000. It is more powerful than computer systems which cost over \$20,000 in the early 1970's.

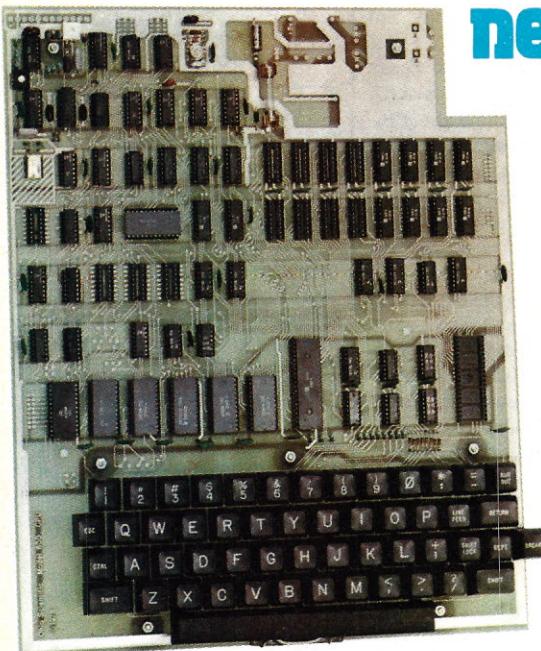
This new machine can entertain your whole family with spectacular video games and cartoons, made possible by its ultra high resolution graphics and super fast BASIC. It can help you with your personal finances and budget planning, made possible by its decimal arithmetic ability and cassette data storage capabilities. It can assist you in school or industry as an ultra powerful scientific calculator, made possible by its advanced scientific math functions and

built-in "immediate" mode which allows complex problem solving without programming! This computer can actually entertain your children while it educates them in topics ranging from naming the Presidents of the United States to tutoring trigonometry — all possible by its fast extended BASIC, graphics and data storage ability.

The machine can be economically expanded to assist in your business, remotely control your home, communicate with other computers and perform many other tasks via the broadest line of expansion accessories in the microcomputer industry.

This machine is super easy to use because it communicates naturally in BASIC, an English-like programming language. So you can easily instruct it or program it to do whatever you want, *but you don't have to*. You don't because it comes with a complete software library on cassette including programs for each application stated above. Ohio Scientific also offers you hundreds of inexpensive programs on ready-to-run cassettes. Program it yourself or just enjoy it; the choice is yours.

Ohio Scientific offers you this remarkable new computer two ways.



Superboard II \$279

For electronic buffs. Fully assembled and tested. Requires +5V at 3 Amps and a video monitor or TV with RF converter to be up and running.

Standard Features

- Uses the ultra powerful 6502 microprocessor
- 8K Microsoft BASIC-in-ROM
Full feature BASIC runs faster than currently available personal computers and all 8080-based business computers.
- 4K static RAM on board expandable to 8K
- Full 53-key keyboard with upper/lower case and user programmability
- Kansas City standard audio cassette interface for high reliability
- Full machine code monitor and I/O utilities in ROM
- Direct access video display has 1K of dedicated memory (besides 4K user memory), features upper case, lower case, graphics and gaming characters for an effective screen resolution of up to 256 by 256 points. Normal TV's with overscan display about 24 rows of 24 characters; without overscan up to 30 X 30 characters.

Extras

- Available expander board features 24K static RAM (additional), dual mini-floppy interface, port adapter for printer and modem and an OSI 48 line expansion interface.
- Assembler/editor and extended machine code monitor available.

Interested in a bigger system? Ohio Scientific offers 15 other models of microcomputer systems ranging from single board units to 74 million byte hard disk systems.

Challenger 1P \$349

Fully packaged with power supply. Just plug in a video monitor or TV through an RF converter to be up and running.

ORDER FORM

Order direct or from your local Ohio Scientific dealer.

- I'm interested. Send me information on your:
 Personal Computers Business Systems
- Send me a Superboard II \$279 enclosed
- Send me a Challenger 1P \$349 enclosed
- Include 4 more K of RAM (8K Total) \$69 more enclosed

Name _____

Address _____

City _____ State _____ Zip _____

Payment by: BAC(VISA) Master Charge Money Order

Credit Card Account # _____

Expires _____ Interbank #(Master Charge) _____
Ohio Residents add 4% Sales Tax

TOTAL CHARGED OR ENCLOSED _____
All orders shipped insured UPS unless otherwise requested. FOB Aurora, OH

OHIO SCIENTIFIC

America's Largest Full Line Microcomputer Company
1333 S. Chillicothe Road • Aurora, Ohio 44202 (216) 562-3101

✓ 05

PUBLISHER'S REMARKS

Wayne Green

New Products

One of the real eye-catchers at the Philly show was the new Southwest Tech terminal. They are now using a Cherry keyboard, and the terminal has enough smarts so it should be able to work with a system without loading it down.

In addition to the SWTP terminal, the photos on this page show new systems from Exidy (the Sorcerer), Imsai (VDP-42) and Xitan (The General), which were also on display.

Business Applications

With more and more of the microcomputer systems obviously aimed at small-business applications there is a growing need for reviews of these systems from that viewpoint. I'm sure that the readers of *Kilobaud* want to know how these systems are working out in business environments, what software is available . . . particularly in systems software, utilities, disk operating systems, etc. Individuals or dealers who have put

together packages for business use should let us all know how they did it.

It is not all that easy to round up all of the software for a business system. How much systems software is actually needed? Where do you find business software? There are several packages being advertised, but I have yet to get a really enthusiastic report on any . . . so if you have an intimate knowledge of a package that really does the job, please let us know about it.

Some months ago we did a write-up of Infotec's and their hardware-software system. They have since doubled their plant capacity, laid on a mobile demonstration unit, and have been written up in the papers and business magazines. Their sales will be over \$5 million for this fiscal year! They have been showing clearly that a good microcomputer system for a specific type of business will not just sell, but will virtually wipe everything else out.

They have been selling to almost 100 percent of the fuel-oil dealers who see their system . . . and now they have a bookkeeping package that is doing the same for accountants.

Let's have more articles on business applications for microcomputers.

Software Review

That headline is deceptive, for this actually is a review of an audio-cassette demonstration of the Newtech music board and software. Newtech amazed the microcomputer industry with their S-100 music board, which was displayed at Computermania in August 1977. This \$60 board even had a small speaker built in for monitoring!

Today Newtech has a second board that plugs into the SWTP 6800 system, also selling for \$60. But, just in case you are a bit cautious with your money, Newtech has prepared a cassette with some sample tunes you can concoct with your computer and one of these boards. Frankly, I've heard catchier music and I doubt if you will put on this cassette and then settle back to enjoy the tunes on it: "The Entertainer," "Dixie," "Star-Spangled Banner." Sixteen of 'em on one side of the tape, and a sonata for clarinet and computer on the other. That one is a bit catchier, and you might want to show it off more than the others. The cassette is \$5.

There was a demo of computer-generated music at the Philly show, and much of it was pretty dismal. Some of the four- (and more) part music was interesting, but I didn't have any inner urges to collect cassettes of computer music as a result of the Philly demo. However, I did want to try my hand at composing via computer.

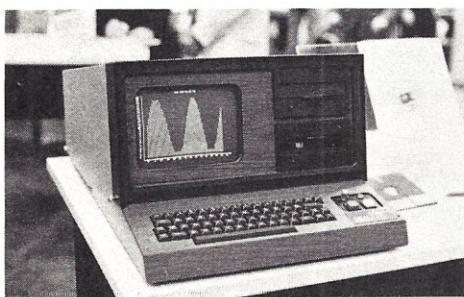
You, too, can thrill to computer music that is about as exciting as a novice on an ocarina.

Newtech Computer Systems, 230 Clinton, Brooklyn NY 11201.

The DEC Store

The first Digital Equipment Corporation store opened recently in the New Hampshire Mall, not far from *Kilobaud* HQ. Naturally we drove over to take a look and see how they were doing, waiting a few weeks for them to get settled in.

Before Digital starts opening a



Imsai has not been resting. Their new low-cost system, VDP-42, was on display. This has two mini-floppies built in.



The new SWTP terminal, in addition to having a good deal of memory built in, which allows it to be used in a remote batch situation, comes in decorator colors. Watch out, Lear Siegler!



One of the newest systems out is the Exidy Sorcerer. With this system, you plug the programs into a slot on the right-hand side. It's an attractive system and has some interesting graphics capabilities. That 8x8 graph you see on the screen is part of a scheme for allowing you to create your own graphics figures. With this, you can define your own characters and then use them when you like . . . or change them.



Xitan had their new system, The General, on display. This one strays from the S-100 bus and has the whole works in a console, complete with the dual disks. More and more we see computer hobby equipment firms going for the business market.



Though I arrived during a time when the mall was quite crowded, the DEC store was not. It's attractively laid out, but there isn't anything much happening in it so there is nothing to draw people in. On later visits to the mall I found the store without customers most of the time.



"Plus service," eh? That's a little scary, but the price is modest at under \$225 per month. It looks awkward to use, but at that price, how much could customers save by buying a microcomputer system? Not so much . . . and they would still have to find the software.

lot more stores it might be worthwhile for them to check out some microcomputer stores and see where the action is. Most stores have a very busy literature section, with all of the magazines and a good selection of books, thus providing the newcomer to small computers a way to get the fundamental information needed to cope. If you don't have traffic into your store, you aren't going to have sales.

One of the other sales obstacles facing DEC is their emphasis on the FOCAL language. BASIC may have its drawbacks, but the wide use of it for microcomputers has forced the development of a growing number of programs in BASIC, most of which can be translated to work with the many dialects of the language. Despite the large number of DEC systems already sold, there is a shortage of application programs for small business in FOCAL. A look through the DECUS book of programs is not encouraging.

It's possible that I may be biased on this, so if there is anyone out there with a strong back-

ground in DEC and DECUS programs, I'm sure *Kilobaud* readers would be interested in a better perspective . . . if any. I try to get the best information I can and pass it along; however, we need all the input we can get on software and systems for business.

What Are the Facts of Program Publishing?

As more and more firms spring up wanting to publish and distribute programs, there are some facts that programmers should consider. It is all too easy for the naive to be taken to the cleaners . . . and the amounts of money involved are large enough to bring out the most unscrupulous promoters.

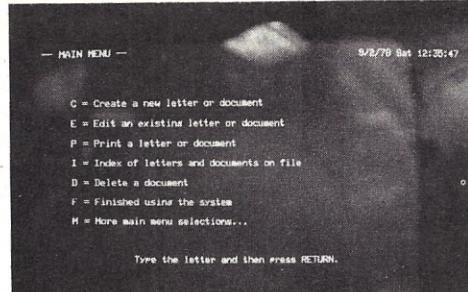
The amount of money a program can earn is determined by the marketing ability of the publisher. Today, with roughly 5000 stores selling computers and all in desperate need of well-tested and packaged programs, the investment and the staff necessary

to market programs is impressive. Just to ready a program for production costs over \$2000. Then there is the first publication run of the program, which adds another \$10,000 to the costs before any income is involved.

With Instant Software we are gearing up to produce a minimum of 10,000 copies of any new program. This would mean an initial royalty payment of nearly \$10,000 for many programmers . . . and it could easily double that if the program was distributed in the Radio Shack stores. The lure of this kind of money has already brought in some programs that obviously have been stolen from others, and I think we'll be seeing a lot more of that.

One stratagem is for an individual to set up a "software exchange." This encourages hobbyists to send in their programs for distribution. Oh, they will be distributed, but with the royalties going to the exchange entrepreneur, not the author of the program.

Programs will sell well if they



Here's the menu. It's certainly simple and geared to the usual office environment. Some word-processing systems get into very complex choices that call for a good deal of expertise and scare off the non-technical people.



The displays at DEC are quite formal and definitely "don't touch me" in tone. This \$12,490 word-processing system might sell better if there were more explanation of what word processing is and how this expensive unit can save you money. If lawyers knew how simple it is to work up standard legal forms with this type of system and that it might save them the cost of the equipment right off the bat just in saved typing time, interest might increase.

kilobaud™

Publisher/Editor
Wayne Green
Executive Vice President
Sherry Smythe
Assistant Publisher/Editor
Jeffrey D. DeTray
Managing Editor
John Barry

Editorial Assistants
Dennis Brisson
Susan Gross

Administrative Assistant
Dotty Gibson
Production Department Manager:
Lynn Panciera-Fraser

Staff:
Craig Brown
Gayle Cabana
Robert Drew
Bruce Hedin
Carl Jackson
James Lamothe
Dion Owens
Noel R. Self
Robin M. Sloan

Typesetting
Barbara J. Latti
Sara Bedell
Mary Kinzel
Holly Walsh

Photography
Bill Heydolph
Tedd Cluff

Associate Editors
John Arnold
Ronald Burris
Rich Didday
Phil Feldman
Steve Fuller
Rod Hallen
Tom Rugg
Peter Stark
Dick Whipple
Ken Widlitz

Bookkeeper
Knud E. M. Keller
Marketing
Robert LaPointe
Judy Waterman

Circulation
Pauline Johnstone
Customer Service
Joyce Tarr
Receptionist
Doni-Anne Jarvis
Computer Programming
Richard Dykema
Micro Lab
Cida Teixeira
Alan Anderson
Walter Asonevich
Shirley Mahoney
Scott Spangenberg
P. T. Wolf
Stan Wszola

Mailroom
Bill Barry
Ethan Perry
Michele Walsh

Advertising
Marcia Stone
Nancy Ciampa
Helene Sandquist
Pat Theriault
Bill York

European Marketing Dir.
Reinhard Nedela

Australian Distributor

Katherine Thirkell

Kilobaud is published monthly by 1001001, Inc., Peterborough NH 03458. Subscription rates in U.S. and Canada are \$18 for one year and \$45 for three years. In Europe: *Kilobaud* erscheint monatlich bei Fachzeitschriftenvertrieb Monika Nedela, 7778 Markdorf, Marktstr. 3. Australia: For subscriptions write—Katherine Thirkell, Sontron Instruments, 17 Arawatta St., Carnegie, Vic. 3163 Australia. Please write for other foreign rates. Second-class postage paid at Peterborough NH 03458 and at additional mailing offices. Publication No. 346690. Phone: 603-924-3873. Entire contents copyright 1978 by 1001001, Inc. INCLUDE OLD ADDRESS AND ZIP CODE WITH ADDRESS CHANGE NOTIFICATION.

are advertised, promoted, distributed to where customers can buy them and are a good value. The larger the outfit doing the distribution and promotion, the better the sales . . . and the more the royalty.

Opportunity Knocketh

In addition to the wads of money that can be made writing programs for our microcomputer systems, there are also fortunes to be made in designing and marketing gadgets and accessories for computers which will permit them to do the many things we would like them to do. I've written about this in the past, but it needs amplification.

It was only three short years ago when we were all excited over the Mits Altair system. You may remember that just about the only use suggested for a microcomputer around the home was watering the grass. Despite that prediction, as far as I know no one is yet watering his grass by microcomputer. What happened to the Great American Dream?

The fact is that no one has bothered to put a grass-watering kit with an S-100 interface on the market. All it takes is a dampness sensor to stick into your lawn, a board to plug into your computer that will check out the readings from this sensor and a solenoid-operated valve for the sprinkling system, which is driven by an output from the computer. Nothing very complicated, really, it's just that no one has put the kit together yet and marketed it. I don't know if such a kit would make a million dollars, but I'd bet it would sell well.

Until we have packaged accessories such as the lawn-waterer, complete with the software to make 'em work, we will have to sell dreams instead of reality. There are hundreds of gadgets that could be developed to work with computers. Think about it and let your imagination run.

What about door locks that can be operated by your computer? . . . perhaps a sensor to let you know how much oil is left in your home fuel-oil tank? . . . and another for your propane tank, if you have one. For security we need motion sensors, light sensors, slow-scan cameras and interfaces, smoke sensors, water sensors, etc.

How soon will we have an optical reader for scanning questionnaires for pencil-marked answers or for inventory taking? There are nice expensive readers for

maxi systems; now we need a simple one for microcomputers.

Another need is for some sort of mag tape backup for those Winchester 75-megabyte disks, but a tape system priced for the microcomputer world.

This brings up the need for an operating system for these relatively inexpensive drives that will permit the use of low-cost microcomputers as remote batch terminals. With this type of system, you would have a low-cost and practical system for schools and businesses. These systems would support dozens of intelligent terminals, each doing different tasks. Oddly enough, the TRS-80 is powerful enough to support a lot of other similar systems if you have the operating system and use a remote batch operation. The programmer who comes up with a good operating system for making all this happen will have the ticket to a very comfortable future in his hand. I know I could sell such a system and parlay it into a royalty of well over a million dollars.

When I see what is possible with microcomputers, given the right programs, I get a very funny feeling when I look at the Prime computer system, which we use for *73 Magazine* and which is bogged down with a fraction of the work I expected from it. Apparently I'm not the only one to have these problems. I mentioned my miseries with our Prime to a girl in one of the exhibits at the recent Boston University computer show, and she said she had run into the same thing with the Prime in a hospital system she had been involved with. Has anyone else suffered?

There is no question that we will continue to see improvements in microcomputer hardware—and we are beginning to see some good software on the horizon—but we are still dreadfully short on accessories to connect to our systems and interface them to the world. *Kilobaud* will be most interested in publishing articles on such accessories. Get cracking on the situation and let's see what happens.

Software Consulting

Perhaps my plans for wholesaling software are too enthusiastic, but considering the number of microcomputers being sold today and the growth curve of the industry, I'm aiming at producing about two new computer systems per day by the end of 1979 and five a day in 1980. If we can get to

an average of five a day sooner, all the better.

The evaluation of the content, prospective sale, program retail price and other factors will be done by associate editors who are functioning as software consultants. As nearly as possible we will try to match talent to the job at hand, sending accounting-type programs to accountants for evaluation, medical programs to doctors, etc.

In order to process and evaluate enough programs to result in a net output of two per day, we will need a formidable array of consultants. If you figure that there probably will be an average of two programs in each cassette package we put out . . . and further that only one program in five will make the grade . . . this means 20 programs per day will have to be evaluated . . . one hundred a week!

Can the industry support such an effort? It's difficult to project what may happen with microcomputers in the near future, particularly after we start having programs available for them in quantities and on a wide variety of subjects. We do know that there are now well over 250,000 microcomputers out there and that they are selling at the rate of about 25,000 per month at present. It is not overoptimistic, I think, to look for perhaps 400,000 to be sold in 1979. This would give us around 650,000 microcomputer programming customers.

How many programs will 650,000 microcomputer owners buy? That's anyone's guess. If they bought an average of two a month, that would come to some 15 million in a year. At an average retail price of \$8 per program tape we would have a \$125 million industry. If microcomputerists run true to form and spend equally for software and hardware, we can expect perhaps four times that investment.

Whatever happens, there is going to be a big requirement on our part for software consultants to check out programs. We've started out with a pay scale of \$3 per hour for the work . . . a figure that is sneered at by some and eagerly embraced by others. It does appear at this moment that we will be able to develop a staff of associate editors with excellent credentials at the figure we've proposed since the work involved is also a lot of fun.

There are some other obvious advantages too, brought about by the need for a test laboratory in your home, an office in your home, the equipment necessary

to perform your work, the books and magazines you must have to properly perform your work, telephone and other incidental expenses, visits to trade shows, etc. You'll probably feel it important to have the latest in equipment; perhaps you'll want to have several different systems up and running for checking out programs and possibly for helping with the translation of programs from one format to another. All of these expenses are business expenses and are necessary for you in your consulting work for us.

If you spend an average of two hours a day this will come to about 15 hours a week, \$45 . . . \$2250 per year. The IRS does not like you to take a loss in your business every year, but they will generally go along with the expenses of developing a new business, and start-up expenses are going to be high for any new effort.

If you are interested in climbing aboard our leaky boat, we'll need information on what equipment you have, what languages you are familiar with, how much experience you've had at microcomputing and programming, what specific fields of expertise you might be able to offer, etc. In return for this we'll send you a package of information on the associate-editor scheme. We do want to be sure that when you get a program to evaluate you will be able to return it to us within a week . . . and that all material will be kept in confidence. No program leaks . . . even to good friends.

Hiring

The Instant Software project is by no means up to full complement. There is still a need for a computer hobbyist with a lot of hardware experience to set up systems, check them out, write reports on them and get accessories working.

There are some spots in advertising, marketing and sales too. Unless I've been dreaming a lot, this new project should turn out to be big and the people who help make it go should end up in good shape.

El-Cheapo Microfilming

While preparing the instruction booklet for a TRS-80 business program, I realized that

(continued on page 21)

LEGAL BUSINESS FORUM

*Kenneth S. Widelitz
Attorney-at-Law*

A lot has been written on the subject of software and copyright. In fact, two previous *Kilobaud Legal/Business Forums* (November 1977, April 1978) have been devoted to the subject. What's all this brouhaha about? Why is the protection of computer software such a burning issue?

In my opinion, the excitement all boils down to the simple fact that we now live in an age of alchemy. No, I don't mean that someone has invented a process for turning lead into gold. What we have is even better. It is now possible to take an item worth \$5 (a blank diskette), insert it into a disk drive, take an item worth \$1000 (a diskette with a general ledger package on it), put that into a second drive, push a button and, a minute later, extract two diskettes with a \$1000 general ledger package on each. That's what I call alchemy.

The point is that hundreds, perhaps thousands, of hours of work can be duplicated in a matter of seconds. That is not true with respect to hardware. Certainly, someone can rip off the design for a piece of hardware, but it takes a lot of capital and a lot of time to gear up to produce that hardware. And it's difficult to produce that hardware in the comfort of one's own home. Not so with the rip-off of software.

CONTU's Final Report

In the November 1977 Legal/Business Forum I discussed a preliminary report issued by CONTU, the National Commission on New Technological Uses of Copyrighted Works. On July 31, 1978, CONTU issued its final report. The report is available free of charge from CONTU, Washington D.C. 20058, telephone (202) 557-0996.

CONTU, in its investigation, has recognized that the alchemy problem is real. CONTU expressed the problem as follows:

"Forces of economic and technological development are leading to what has been called the post-industrial society, one in which the source of wealth lies not only in the production and distribution of goods but also in the creation and dissemination of information."

Continuing in the same vein, the report goes on: "The cost of copying a reel of magnetic tape, whether it contains a Chopin étude or a computer program, is small. Thus the following proposition seems sound: If the cost of duplicating information is small, then it is easy for a less than scrupulous person to duplicate it. This means that legal as well as physical protection for the information is a necessary incentive if such information is to be created and disseminated."

CONTU's Recommendations

CONTU's recommendations are addressed to Congress, which must pass appropriate legislation in order to amend the Copyright Act of 1976. CONTU recommends that a definition be added as follows: "A 'computer program' is a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result." CONTU also recommends the following language be implemented in the Copyright Act:

Notwithstanding the provisions of Section 106, it is not an infringement for the rightful possessor of a copy of a computer program to make or authorize the making of another copy or adaptation of that computer program *provided*:

- (1) that such a new copy or adaptation is created as an essential step in the utilization of the computer program in conjunction with a machine and that it is used in no other manner, or
- (2) that such new copy or adaptation is for archival purposes only

and that all archival copies are destroyed in the event that continued possession of the computer program should cease to be rightful.

Any exact copies prepared in accordance with the provisions of this section may be leased, sold or otherwise transferred, along with the copy from which copies were prepared, only as part of the lease, sale or other transfer of all rights in the program. Adaptations so prepared may be transferred only with the authorization of the copyright owner.

As discussed in the previous Forum on copyright, it is CONTU's conclusion that the input of a program into a computer is the preparation of a copy and, therefore, a potential infringement of copyright. The new section quoted above indicates that a person in the rightful possession of a copy of a program may load the program. However, the sale of a copy of a rightfully possessed program must be a sale of all rights in the program, thus creating a new rightful possessor and destroying that status as regards the seller.

The proposed language quoted above also covers, at least in part, a question that was raised in the April 1978 Legal/Business Forum regarding derivative works. CONTU has recognized that because of the lack of standardization among programming languages and hardware, often one who rightfully acquires a copy of a program frequently cannot use it without adapting or modifying it so that it will run in the computer for which the program was purchased. The proposed language quoted above refers to those "patches" as "adaptations."

The language of the proposed section indicates that programs which have been adapted to run in a specific computer could *not* be conveyed to others along with the unmodified program without the express authorization of the owner of the copyright in the original work. This does not mean that the unmodified program could be sold while the modified version was retained. That would be a violation of the Copyright Law.

That distinction regarding adaptations seems to me to be a bit ludicrous. Certainly the "adapter" could sell the original program unmodified and, in a separate transaction, sell the "adaptations" or "patches." The "patches" alone could be copyrighted by the adapter. Why prohibit the use of a one-step

transaction when legally the same thing can be accomplished using two steps?

Recommendations for Regulations

CONTU has recommended that regulations for notice, deposit and registration of programs should be promulgated by the Register of Copyrights. CONTU recommends that programs marketed in a form readable to the human eye should contain the copyright notice before the list of instructions that comprise the program. With respect to machine-readable formats, CONTU recommends that the notice be such that the program could not be listed without reproducing the notice at the beginning of the instructions.

Interestingly, CONTU goes on to say that the containers in which copies of such machine-readable programs are sold, leased or transported should bear notice as should devices such as (1) reels upon which magnetic tape is wound, or (2) semiconductor chips in which programs are stored. The latter may create some conflicts with the Patent Law. Some companies have successfully patented computer programs by getting the patent on "firmware." Since patent and copyright are mutually exclusive, it will be interesting to see how this conflict is resolved.

In discussing the deposit and registration requirements, CONTU notes that programs are frequently modified and updated to reflect improvements or changes. CONTU acknowledges that the repeated deposit of each version of a program would be burdensome both to the program proprietor and to the Copyright Office. CONTU recommends two alternative solutions to this problem. One is a system of temporary deposit and the other is a scheme in which there would be a permanent deposit of complete copies of original versions of a program with descriptions rather than complete copies of amended versions being filed later.

Scope of Copyright

CONTU's report contains an interesting discussion of the distinction between programs, which CONTU recommends be subject to the Copyright Laws, and processes that are not subject to copyright. In pointing out the

distinction between programs and processes CONTU states:

In *Baker v. Selden* the Supreme Court held that a valid copyright in a book describing a system of accounting, based upon the now-universal T-accounts, did not bar others from using that accounting system. This holding is often misconstrued as imposing a limit on the copyrightability of works which express ideas, systems or processes. As Professor Nimmer observes, "The rationale for the doctrine of *Baker v. Selden* in no event justifies the denial of copyrightability to any work." The case properly stands for the proposition that using the system does not infringe the copyright in the description.

With respect to computer programs it may be said that the expression adopted by the programmer is the copyrightable element in a computer program. The actual processes or methods embodied in a program are not within the scope of the Copyright Law. CONTU goes on:

Thus one is always free to make a machine perform any conceivable process (in the absence of a patent), but one is not free to take another's program. This general rule is subject to excep-

tions which restrict the power of copyright owners. These exceptions might be thought of as the "insufficient intellectual labor" exception and the "idea-expression identity" exception.

The "insufficient intellectual labor" exception encompasses the idea that a program consisting of a very few obvious steps cannot be the subject of a copyright as is the case with instructions such as "apply hook to wall."

The "idea-expression identity" exception provides that copyrighted language may be copied without infringement when there is a limited number of ways to express a given idea. That is, copyright protection for programs does not threaten to block the use of ideas or program language previously developed by others when that use is necessary to achieve a certain result.

The CONTU report states, "When other language is available, programmers are free to read copyrighted programs and use ideas embodied in them in preparing their own works." In other words, the programmer is always free to make the computer do the same thing it would have done had the copyrighted work been placed in it, but only by the programmer's own crea-

tive effort rather than piracy.

Therefore, if you see a Star Trek program with great graphics displayed on a CRT and figure out how to do the same thing without copying the underlying program, there is no copyright infringement even though the display of your programming efforts is identical to the results of the efforts of the programmer whose program you observed.

In CONTU's concluding remarks regarding the line drawn between the copyrightable form of a program and the uncopyrightable process it implements, the report states, "In the event that future technology permits programs to be stated orally for direct input to the computer through auditory sensing devices or permits future infringers to use an author's program without copying, difficult questions will arise." CONTU states, however, that to attempt to establish such a line in a report written in 1978 would be futile.

A Dissent

As with the preliminary report, Commissioner John Hersey has dissented from CONTU's recommendations. Hersey's reasoning

is the same as in the prior report, and since that was discussed in the November 1977 Forum I won't go into it in detail.

One interesting aspect that Hersey now mentions deals with the issue of communication. He says, "But a program, once it enters a computer and is activated there, does not communicate information of its own, intelligible to a human being. It utters work. Work is its only utterance and its only purpose. So far as the mode of expression of the original writing is concerned, the matter ends there; it has indeed become irrelevant even before that point. The mature program is purely and simply a mechanical substitute for human labor."

Later in his report Hersey says, "Here, for the first time, protection of copyright would be offered to a 'communication' with the machine."

In my opinion, Hersey makes some good points in his dissent, but they are not significant enough to change my agreement with the conclusions expressed in CONTU's report.

*Kilobaud Legal/Business Forum
c/o Kenneth Wideltz
10960 Wilshire Blvd.
Suite 1504
Los Angeles CA 90024*

PET-POURRI

Len Lindsay

Len Lindsay is a certified elementary-school teacher. He has been interested in computers since high school. Collecting and distributing information is one of the things Len likes to do; since he owns a PET computer, he has collected quite a bit of information about it. He is the editor of the PET Gazette and hopes that its PET Cassette Exchange can distribute good programs inexpensively. Presently Len is employed by the state of Wisconsin, Dept. of Administration, Data Control.

With over 100 companies supporting the PET, you can expect to be able to get almost any plug-in accessory you want. You're right! The first things on most users' lists are a printer, floppy

disk, extra memory and full-size keyboard.

Accessories

Commodore first announced their printer early last summer . . . expected delivery in late August. The price has since then gone up \$100 to \$695 and delivery is now indefinite, probably March or later. But there are several adapters on the market that allow any RS-232 printer to be hooked to the PET.

Connecticut microComputer (150 Pocono Rd., Brookfield CT 06804) has a printer adapter for \$169 completely assembled with case, power and cables, and the Networks (5924 Quiet Slope Dr., San Diego CA 92120) has a dual-

channel, bidirectional RS-232 module for \$280, assembled.

Two companies now have floppy disk modules for the PET: Convenience Living Systems (648 Sheraton Dr., Sunnyvale CA 94087) and CGRS Microtec (PO Box 368, Southampton PA 18966). Commodore supposedly will have a dual mini-floppy for \$1000, but don't expect to get one till next summer.

The PET is extremely memory efficient, and you will find that even a 16K program can be coded into an 8K PET. Thus, for ordinary use, 8K should be enough. There are, however, several memory expansion modules available now (none from Commodore yet).

Convenience Living Systems has the ExpandaPET module, 16K for \$399. Computer Mart Systems (13 East 30th St., New York NY 10016) has the PME-1 with 16K for \$550. International Technical Systems (PO Box 264, Woodbridge VA 22194) has the PME-8K for \$279.

Due to the PET's small keyboard, most users wish to have a full-size keyboard to plug in, but still keep the original keyboard functional. Excel Company (2241

Tamalpais Ave., El Cerrito CA 94530) has an adapter for \$100 that allows you to plug in any ASCII keyboard and use it simultaneously with the original keyboard. For \$175 they have a full-size keyboard you just plug in and use. New England Electronics (248 Bridge St., Springfield MA 01103) has a full-size keyboard for about \$125 that operates simultaneously with the PET keyboard.

Next month we will go over more products for the PET, ready to plug in and use.

Publications

PET users should be aware of the following PET publications, books and magazines. There are four principal publications dealing strictly with the PET. These publications are similar and each contains information on the PET and how to program it, program listings, product announcements and program exchange information.

The *PET Gazette* magazine (1929 Northport Dr., Room 6, Madison WI 53704). Subscrip-

tion is *free*, published bimonthly. Issue #5 was 64 pages. Beginning in 1979 will be a full-size magazine. Also includes a directory of all PET-related companies with addresses, lists of all PET accessories and software available, directory of PET user clubs and meeting information, reviews of MANY accessories and software, and proposals of standard conventions to follow to keep most users compatible with each other.

The PET Paper (PO Box 43, Audubon PA 19407). Subscription is \$15 per year, published 10 times per year. Issue #6 was 22 pages. Also includes PET clubs information and some review.

PET User Notes (Box 371, Montgomeryville PA 18936). Subscription is \$5 per year, published bimonthly. Issue #5 was 16 pages.

From England—*Commodore PET Users Club Newsletter* (Commodore Systems, 360 Euston Rd., London England NW1 3BL. Subscription is 10 pounds, published bimonthly. Issue #3 was 40 pages. This is the official Commodore newsletter in Europe. Very informative.

A few books of direct interest to PET users are already available.

Total Information Services (TIS, PO Box 921, Los Alamos NM 87544) publishes five workbooks for the PET: *Getting Started with Your PET* (\$4), *String and Array Handling* (\$4), *Graphics* (\$5), *Cassette I/O* (\$5) and *Miscellaneous* (\$4). These workbooks explain how the PET functions and has many programming tips.

The PET Paper (see above) publishes the *PET Tutor*, a manual for the beginning PET user. It is accompanied by 20 8K lessons on tape, ready to load into your PET. The cost for the manual and tapes is \$39.95.

A few more books should be available soon. Osborne and Associates are working on a PET user manual, which should come in with the new year. *The PET Paper* hopes to have their book about the PET available by March 1979. The Microcomputer Resource Center will be publishing a book, *The Best of the PET Gazette*, during November 1978.

Several magazines feature the PET every issue. *Kilobaud* now has a PET column (which you are now reading), and *Creative Computing* (PO Box 789-M, Morris town NJ 07960) is featuring a column for the PET by Greg Yob. *Recreational Computing*, formerly *People's Computers* (1263 El Camino Real, Box E,

```

100 PRINT"Do you need instructions?"
110 GETA$: IF A$ = "" THEN GOTO 110
120 IF A$ = "Y" THEN GOSUB 1000:REM INSTRUCTIONS START AT 1000
130 Your program continues here.
Remember, your instructions are in a subroutine beginning at 1000. The
last command should be:
1999 RETURN (use the appropriate line number)

```

Example 1.

```

1500 PRINT"This is the end of instructions"
1510 PRINT"Hit any key to continue"
1520 GET A$: IF A$ = "" THEN GOTO 1520
1530 Program continues here after waiting for the user to hit a key

```

Example 2.

Menlo Park CA 94025), has a section titled SPOT each issue. They have program listings and information for PET users. *Calculators/Computers* has a feature article each issue about the PET, with programming aids or listings.

Software

There is quite a bit of software for the PET available on cassettes. There are probably over 1000 different programs already.

Personal Software (PO Box 136-L10, Cambridge MA 02138) has several good programs. For \$20 the PET will challenge you to a game of chess, and will probably beat you. For \$15 you can play bridge with your PET.

I composed this article using several different word processor programs currently available. Connecticut microComputer has a good word processor for \$30.

Business software is now becoming available. Sawyer Software (828 Lewis, Rte. 3, Dexter MO 63841) has some good programs, including Accounting (\$25), Payroll (\$30) and Business Analysis (\$30). Channel Data (5960 Mandarin Ave., Goleta CA 93017) has Personal Ledger for \$20.

As you might expect, there are many games available. CMS (5115 Menefee, Dallas TX 75227) has some excellent games. For \$10 each you can play a very realistic, full graphics game of blackjack, roulette, craps or baccarat. You also can challenge the

PET to a game of checkers, cubic, or gomoku.

Creative Computing is selling cassettes with about five or six programs for \$7.95. Their games make use of the PET's graphic capabilities.

Dr. Daley (425 Grove Ave., Berrien Springs MI 49103) has many programs for sale, including Star Trek (\$7.95), Dictator (\$8.95) and Football (\$6.95).

New England Electronics (248 Bridge St., Springfield MA 01103) is a dealer for many of the PET software companies. They also market their own programs, such as War Games Package (\$25), four well-done animated, sound-effect programs. Write for their catalog of PET products.

There are several places offering a PET software exchange, with purchase options.

The PET Cassette Exchange (1929 Northport Dr., Room 6, Madison WI 53704) has over 200 programs available for exchange. Categories are: *Useful*—Budget, Biorhythm, Decision Maker, Loans and more. *Demo*—Abstract Art, Kaleidoscope, Star Wars Pictures and more. *Educational*—Animal, History Quiz, Spelling Test, States & Capitals and more. *Music*—Music Keyboard, Computer Music, Theme from Star Wars and more. *Simulations*—Market, Stock Market and more. *Cards*—Blackjack, Poker and more. *Games*—Breakout, Checkers, Othello, PET Pong, Snake, Star Trek and more. Selected programs from the exchange are available as packages of seven programs for \$10.

Both the *PET Paper* and the PET User Group (Box 371, Montgomeryville PA 18936) have software exchanges with purchase options.

Write to each exchange for full information on how their exchange works.

Another way to acquire good programs is to subscribe to *Cursor* (Box 550, Goleta CA 93017). *Cursor* is a magazine cassette for the PET. Each month you receive about six programs on a cassette. The programs are very good and most are unique. The cost is \$24 per year.

Programming Hints

Use lowercase whenever the user has to read a lot of text, such as in instructions. To put the PET into lowercase mode simply add a line: 225 POKE 59468,14: REM LOWERCASE MODE. To return to graphics mode: 280 POKE 59468,12. Don't assume that the PET will be in graphics mode. One of your first lines should poke in the mode you wish to use first. Throughout your program you can switch from graphics to lowercase and back again.

The PET has a GET command. This allows you an easy way to input information, while your program is running, without having to hit the return key (see Example 1). Another use of the GET command is for indefinite delays (see Example 2). Clear the screen before starting. Use a line such as: 60 PRINT "[CLR]":REM CLEAR THE SCREEN.

As with the line above, I will use standard conventions for listing PET graphics and special keys. (1) Use KEY CAP identifiers if possible and enclose them in square brackets (use regular parentheses if square brackets are unavailable). (2) Use a number before an item to show how many times it is to be repeated. (3) Enclose consecutive special keys within the same brackets, separated by commas (see Example 3). Remember, a capital letter inside brackets means to type the shifted character.

(continued on page 21)

```

230 ?"[HOME]":REM PRINT A HEART 3 SPACES DOWN FROM THE TOP LEFT CORNER
You type:
2 3 0 ? " the HOME key CURSOR DOWN 3 times shift S " : R E M P R I N T
A etc.

```

Example 3.

A Short Course in Programming, Vol. I
Tom Pittman
Netronics R&D Ltd.
New Milford CT
80 pages, \$5

For the last few years, the hobbyist who had a system based on the RCA 1802 COSMAC microprocessor had to look enviously at the users of "those other" chips who could choose from among many books geared to their micro. Although RCA has had several books in print that addressed the COSMAC, these were aimed at the engineer and designer, rather than the beginner. Finally, though, a publication has appeared that is the answer to many a prayer.

A Short Course in Programming packs a lot of information into its 80 pages, including all of the commands for the 1802, arithmetic and logic, and control instructions, as well as the video features available on most Elf and Elf II microcomputers. The chapters go into detail by utilizing appropriate programs rather than relying on printed descriptions. This allows for much better understanding, although the reader may find himself spending several evenings on one program in order to fully master the concept involved.

The programs not only make the concepts presented understandable and interesting, they can be quite impressive by themselves. An example is a video clock that counts seconds on a TV screen.

Although the booklet is primarily aimed at owners of Netronics' Elf II, anyone with an 1802 system with video output can use it. The programs will run in either the original 256-byte memory of the Elf or in the memory of an Elf that has been expanded either to include the monitor or several K of RAM . . . although the longest program occupies just a little less than one-quarter K.

As a firm believer in the merits

of the 1802, I found the booklet informational and useful. I was delighted to see, in print, Tom Pittman's belief that the subroutine-call capability of the 1802 makes it more powerful than any other 8-bit microprocessor.

Stephen F. Nowak
Toledo OH

The SSI Microcomputer Software Guide
Jim Schreier
SSI Publications, 1978
140 pages, \$7.95

For some microcomputerists, there is no greater fulfillment than the successful completion of a complex and lengthy software project. The rest of us owe a debt of gratitude to these intrepid programmers—they sure save us a lot of work. If you would rather use software than write it, *The SSI Microcomputer Software Guide* can help you bypass the sometimes painful programming process.

The author has divided software into 236 classifications, arranged alphabetically from Accounting and ASCII to Word Processing and Zip Code. It's an interesting commentary on the state of microcomputer software that only nine pages of the book are devoted to business programs, whereas the "Games" category fills a healthy 21 pages of the *Guide*. Programmers take note: There are games aplenty for our machines. How about bending your talents toward the practical side of things? Would you believe there are 18 different Star Trek programs listed? That makes Star Trek a category unto itself. Enough, already!

Each of the more than 2200 entries in the *Guide* tells you the language in which the software is written and where it can be acquired. The entries have been compiled from the offerings of software houses, books, magazine articles, pamphlets, etc. In all, software from 130 different

sources is indexed. Best of all, the addresses of all 130 sources are listed at the rear of the book.

The *Guide* contains much more than Star Trek games, of course. In fact, the chances are good that you'll find at least one program in just about any category you can name. There is quite a selection of computer-assisted instruction (CAI) programs, for example. You'll find an entry under "Gardening." There's even a "Judo" category.

The \$7.95 price tag on this 140-page volume may seem a little steep to some, but that's a decision you'll have to make for yourself. It just could save you from reinventing the wheel. SSI Publications, 4327 East Grove St., Phoenix AZ 85040.

Jeff DeTray
Kilobaud Staff

An Introduction to Personal and Business Computing
Rodnay Zaks
Sybex, Inc., Berkeley CA
245 pages

In *An Introduction to Personal and Business Computing*, author Rodnay Zaks fulfills his promise to present "a practical, progressive introduction to all the elements of a real computer system" for readers unfamiliar with computers. Businessmen and individuals interested in computing can gain a clear, comprehensive introduction from this book. Experienced computer people can gain insight into the microcomputer arena and its relationship to larger-scale computing systems.

After he has introduced the reader to some existing and some possible computer applications, Zaks explains the fundamentals of computing. He is practical when he points out that economics is a major factor in determining what computer systems are developed.

His techniques for emphasizing the economic aspects of computers are: describing all the computer system components and discussing the cost considerations employed in selecting from the myriad of choices; giving present-day prices to help relate the costs of components; and helping develop an understanding of values.

Buying a computer, as Zaks indicates, is not the only way to get into computing. Other routes he mentions are the service bureau and time-sharing, both of which provide a low-cost "try before

you buy" alternative to purchasing equipment.

Rodnay Zaks is a knowledgeable professional, renowned in his business. He offers a wealth of information and good advice in this simple, yet comprehensive, text. By carefully reviewing this book, you will have a good background for further study. You will come away with an appreciation of the broad spectrum of considerations involved in obtaining a computer and have a list of specifics for further research.

Charles E. Moellinger
Birmingham AL

Some People Just Won't Believe a Computer
Donald D. Spencer
Camelot
Ormond Beach FL, 128 pages

One trademark of good (i.e., funny) humor is "the twist"—an unexpected or clever reversal of a familiar situation. *Some People Just Won't Believe a Computer* just doesn't do it. This book manages to present nearly every stock comedy, mundane and extraterrestrial situation in cartoon form and throw a computer-oriented caption (sometimes misspelled) underneath it. For example: A man is lying on a psychiatrist's couch; the shrink is taking notes. The supine sap laments: "My computer doesn't understand me."

I'd begin to question the sanity of anyone who would pay \$4.95 (\$8.95 hardbound) for this assemblage of 123 cartoons (a few virtual duplications of others) by cartoonists John Beaty, Sid Corhern, Rick Dreyer and Don Spencer—the compiler.

Apparently the theme of *Some People Just Won't Believe a Computer* is that the computer personified is "smiles, chuckles and just plain fun." I don't believe it. It takes more than an anthropomorphized anthology of cartoons to amuse or generate laughs.

In all fairness to the book, though, several of these cartoons exhibit wit and innovation. The final drawing features a Hamlet-like figure cogitating. His thought balloon reads: "2B v 2B."

However, if you, like Hamlet, suffer from indecision, the question "to buy or not to buy?" this book should be an easy one to answer.

John Barry
Kilobaud Staff

Color. VP-590 add-on Color Board allows program control of 8 brilliant colors for graphics, color games. Plus 4 selectable background colors. Includes sockets for 2 auxiliary keypads (VP-580). \$69.*

Sound. VP-595 Simple Sound Board provides 256 tone frequencies. Great for supplementing graphics with sound effects or music. Set tone and duration with easy instructions. \$24.*

Music. VP-550 Super Sound Board turns your VIP into a music synthesizer. 2 sound channels. Program control of frequency, time and amplitude envelope (voice) independently in each channel. Program directly from sheet music! Sync provision for controlling multiple VIPs, multitrack recording or other synthesizers. \$49.*

Memory. VP-570 RAM Expansion Board adds 4K bytes of memory. Jumper locates RAM in any 4K block of up to 32K of memory. On-board memory protects switch. \$95.*

EPROM Programmer. VP-565 EPROM Programmer Board comes complete with software to program, copy and verify 5-volt 2716 EPROMs—comparable to units costing much more than the VP-565 and VIP put together! Programming voltages generated on board. ZIF PROM socket included. \$99.*

EPROM Interface. VP-560 EPROM Interface Board locates two 5-volt 2716 EPROMs (4K bytes total) anywhere in 32K of memory. VIP RAM can be re-allocated. \$34.*

ASCII Keyboard** Fully encoded, 128-character ASCII encoded alpha-numeric keyboard. 58 light touch keys including 2 user defined keys! Selectable upper and lower case. Handsomely styled. Under \$50.*



Tiny BASIC VP-700**
Expanded Tiny BASIC Board puts this high-level language on your VIP. BASIC stored in 4K of ROM. Ready for immediate use—no loading necessary. This expanded BASIC includes the standard Tiny BASIC commands plus 12 additional—including color and sound control! Requires external ASCII encoded alpha-numeric keyboard. \$39.*

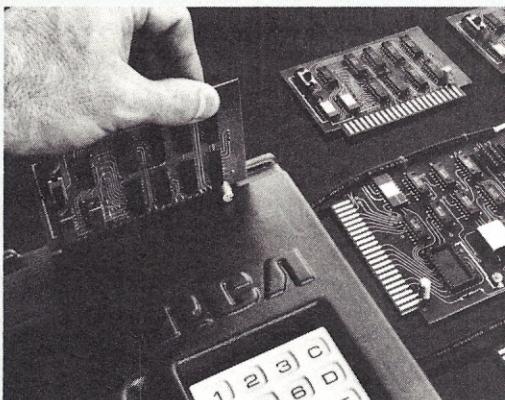
Auxiliary Keypads. Program your VIP for 2-player interaction games! 16-key keypad VP-580 with cable (\$15*) connects to sockets provided on VP-590 Color Board or VP 585 Keyboard Interface Card (\$10*).

COSMAC VIP lets you add computer power a board at a time.

With these new easy-to-buy options, the versatile RCA COSMAC VIP (CDP18S711) means even more excitement. More challenges in graphics, games and control functions. For everyone, from youngster to serious hobbyist. And the basic VIP computer system starts at just \$249* assembled and ready to operate.

Simple but powerful—not just a toy.

Built around an RCA COSMAC microprocessor, the VIP includes 2K of RAM. ROM monitor. Audio tone with a built-in speaker. Plus 8-bit input and 8-bit output port to interface relays, sensors or other peripherals. It's



easy to program and operate. Powerful CHIP-8 interpretive language gets you into programming the first evening. Complete documentation provided.

Take the first step now.

Check your local computer store or electronics parts house. Or contact

RCA VIP Marketing, New Holland Avenue, Lancaster, PA 17604. Phone (717) 291-5848.

*Suggested retail price. CDP18S711 does not include video monitor or cassette recorder.

**Available 1st Quarter, 1979.

The fun way into computers.

RCA

In addition to the standard Electric Pencil features—free format entry, line and character insertion, line and character deletion, forward and reverse scrolling with speed control, string search, coded string search, string search and replace, block moves, inserts and deletions, fully formatted print control, page titling, page numbering, etc.—the TRS-80 version offers the following features:

- 1) Loads into either Level I or Level II 16K computers from the same tape. Load rate is 500 baud.
- 2) Operates uppercase only in unmodified machines or operates with upper and lowercase after installation of modification kit.
- 3) Displays a transparent cursor. The character and the cursor are both visible simultaneously so you can see the character you are editing.
- 4) Runs either the Radio Shack standard printer through the expansion box or will operate any RS-232 300 baud printer using the TRS232 printer interface.
- 5) Includes special keyboard software with both 2-key rollover and repeat function (any key will repeat at 10 characters per second after a 0.5 second delay).

The Electric Pencil is priced at \$99.95; the TRS232 printer interface is \$39.95. Instructions for the lowercase modification are included in the documentation.

Small System Software, PO Box 483, Newbury Park CA 91320.

Programmable Terminal

Now you can enjoy the convenience of a ROM-based system without sacrificing programmability with the ECD Smart ASCII-2 Programmable Intelligent Terminal. It automatically loads its programs from a built-in minicassette drive when it is turned on. This provides the stability of a ROM while allowing easy changing or updating of the system programs.

The standard terminal/word processing program can be modified to emulate different protocols, character codes, character sets or other specific terminals. Because the character set is also loaded from the minicassette, foreign languages can also be accommodated.

In addition to the terminal program, a version of BASIC is also provided to run in the Smart ASCII-2. It can be run stand-alone or in communication with other computers. BASIC can also be used to control the RS-232 in-



The ECD Smart ASCII-2.



Computer control with the RS-16-HP interface.

terfaces, the serial or parallel I/O lines or the analog I/O lines, all of which are standard with the system. In this fashion, the Smart ASCII-2 can be used as a remote intelligent controller and interface to a wide variety of other equipment.

The standard Smart ASCII-2 includes a 15 inch CRT, an 80-key keyboard, processor unit with 37K of memory and a minicassette drive with tapes for intelligent terminal and BASIC programs. Unit price is \$7700. Options are available.

ECD Corp., 196 Broadway, Cambridge MA 02139.

Morse Code Transceiver

Xitex Corporation, 13628 Neutron, PO Box 402110, Dallas TX 75240, has just introduced a Morse code transceiver designed around a preprogrammed single-chip microcomputer for the generation and reception of Morse code signals using a standard ASCII or five-level terminal (such as Xitex Model SCT-100). Applications include military and amateur, plus certain commercial communication systems.

The microcomputer's on-chip 2048 byte ROM memory contains both the Send and Copy algorithms, plus a software UART with multiple ASCII and five-level baud rates. All timing signals are generated internally from a single external 4 MHz crystal. This not only reduces system costs, but also virtually eliminates RFI generation or susceptibility.

The Copy portion of the device provides automatic synchronization from 1 to 150 wpm while it is continuously computing and displaying the corresponding wpm value. The Send mode features include precise control of the output Morse wpm rate in unit increments from 1 to 150 wpm, plus a 32 byte FIFO buffer that can be edited prior to transmission. Another feature permits both Send

and Copy operation in a unique "RTTY Emulate" mode. This permits the transmission of a 60-character ASCII subset using standard Morse codes plus "new" codes defined for special symbols and control characters (such as line feed, space, carriage return, etc.).

The MRS-100 Morse Transceiver is offered in three basic configurations: a partial kit including the microcomputer and blank PC boards for \$95; a full kit including an enclosure, power supply and all other components necessary to configure a complete system (less terminal) for \$225; an assembled and tested unit for \$295.

"Universal" Interface for PET

The RS-16-HP plugs into the Commodore PET's parallel I/O port and can be used for a wide variety of control applications. Using the PET's BASIC interpreter or programming directly in 6502 assembly language or even from the PET's interactive console, you can give commands to the RS-16 causing it to drive any one of 16 output devices or to sense the condition of 16 to 24 input devices.

Output devices can be any 6 volt or less ON/OFF mechanism using less than 1/4 Ampere. For example, lamps, LEDs, solenoids

and dc motors are typically used. Erector set motors and Meccano gears sets are popular electro-mechanical devices for computer control hobbyists. Relay coils can be driven directly; by selecting a 6 volt relay with appropriate contacts, you can use the PET to control most appliances with manual switches, for example, R/C car handsets, model train switch boxes, stereos, garage door openers, etc.

Input devices can include TTL gates or any form of switch contacts, including thermostats, reed switches (as in burglar alarms and train detectors), microswitches (detecting closed doors), joysticks, keyswitches and numeric keypads. Each of these hooks directly to the RS-16, and the PET can read the switch for open or closed condition. Up to eight of these switches can be wired for fast operation; a switch closure can be "captured" and held until the PET recognizes it and then releases the stored data.

All output and input devices are wired through a single 44-pin connector, which is available at most electronics stores for about \$3. A different connector can be used for each peripheral—one for a burglar alarm, one for an electric train set, etc.—so that a single RS-16 can be used for many peripheral systems.

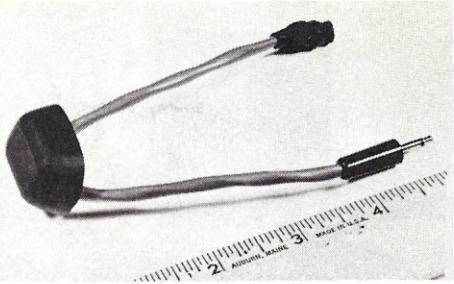
The RS-16-HP comes completely assembled and tested, with an installation manual, for



The MRS-100 Morse Code Transceiver.



Heath's ID-4001.



TBUFF module for TRS-80.

\$229. The installation manual, describing peripheral wiring and PET software, can be purchased separately at \$6, with that amount refundable if the RS-16-HP is purchased later.

Cooper Computing, Box 16082, Clayton MO 63105.

Digital Weather Computer

Now you can be a man for all seasons with the ID-4001 Computerized Weather Station from Heath Company, Dept. 350-730, Benton Harbor MI 49022. The microprocessor-based ID-4001 indicates time, indoor and outdoor temperatures, wind speed and direction and barometric pressure on an upright display panel utilizing large LED readouts. It will also display average wind speed and automatically calculate wind chill factor as well.

The ID-4001's memory allows instant recall of date and time of maximum and minimum temperatures, wind gusts and barometric pressure. It can even indicate the barometric pressure's rate of change per hour and tell if it is rising or falling.

The ID-4001's six-digit time/date display shows time in hours, minutes and seconds and the date in month and day. The time/date can be displayed alternately, or either may be displayed continuously. The 12-hour time format has an AM-PM indicator.

A two-digit display shows wind speed in mph, kph or knots. A 16-indicator wind vector display, identified by compass points and radial degrees, indicates wind direction. The thermometer display indicates indoor or outdoor temperature in degrees F or C with + or - signs. A four-digit display shows barometric pressure in inches of mercury or millibars. Separate indicators show rising or falling pressure. Kit and assembled versions of the ID-4001 are available for \$369.95 and \$595, respectively.

The 6800-Based Chieftain

A new high-performance dual-floppy microcomputer, featuring SS-50 bus compatibility and a new controller design, has been introduced by Smoke Signal Broadcasting, 6304 Yucca St., Hollywood CA 90028. The new Chieftain microcomputer is a versatile, general-purpose system based on the 6800 microprocessor with 32K of static RAM.

Standard features include two serial I/O ports, two mini-floppies and the compatible DOS-68 disk operating system. Increased reliability is obtained through the use of gold connectors to eliminate continual re-seating of boards and a cooling fan to extend component life.

The new microcomputer allows up to 60K of usable memory with the addition of two more

slots. Disk storage can also be increased to four mini-floppies or four 8-inch floppies. Price for the Chieftain is \$2595.

Shake Those Microwelding Blues

You don't have to get hung up on a TRS-80 cassette drive hang-up. Untangle yourself with the TBUFF module from Web Associates.

If you are running a lot of data saves or loads on your TRS-80, during which the cassette is turned on and off several times a minute, then you are particularly vulnerable to microwelding, which occurs as a result of excessive current and heat buildup in the cassette control reed relay. The microwelding is further aided by a slight, self-holding, electromagnetic force induced by the high recorder current. This added electromagnetic force is why, in most cases, the hang-up goes away when the cassette is manually turned off.

Web Associates has a simple, inexpensive, non-repair-shop solution. The TBUFF module simply plugs in series with the REMOTE cable between the TRS-80 and the recorder. TBUFF significantly reduces the current

passed through the reed relay in the TRS-80. At the same time, owing to careful design techniques, TBUFF delivers full power to the recorder, thus maintaining proper tape speed and volume levels. TBUFF sells for \$7.95 (Californians, add 6 percent).

Web Associates, Box 60-N, Monrovia CA 91016.

6502 Assembler for PET

The 6502 Assembler in BASIC lets you write programs in assembly language for the 6502 microprocessor and have them translated to machine language for direct execution on the PET. The assembler accepts all standard 6502 instruction mnemonics, pseudo-ops and addressing modes and evaluates binary, octal, hex, decimal and character constants, symbols and expressions.

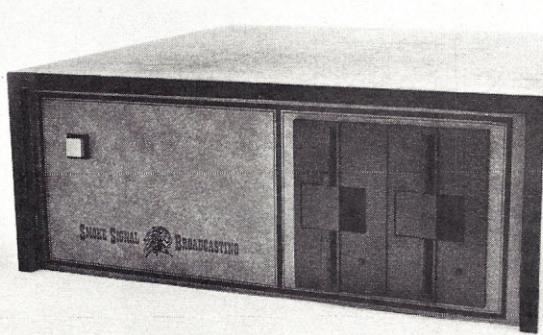
Source programs can be read from cassette, and object programs can be assembled anywhere in memory. The package includes both one- and two-pass versions of the assembler, a text editor and a disassembler, with a 30-page manual including PET machine-language programming hints. It is priced at \$24.95.

Personal Software, PO Box 136, Cambridge MA 02138.

A-MUSE-ing Software

The MUSE (Micro Users Software Exchange) Company announces a complete line of software for the Apple II. A full feature text editor (\$17.95) allows management of free-form text;

(continued on page 116)



SSB's Chieftain.



Assembler for the PET.

ARE YOU ON FREQUENCY?

BE ON FREQUENCY WITH DSI



MODEL 3600A .5PPM 17° - 37°C \$199.95

- AUTO ZERO BLANKING
- AUTO DECIMAL POINT
- INCLUDES ANTENNA

SAVE SHOP COSTS WHEN ADJUSTING XTALS
MEET YOUR QSO ON FREQUENCY EVERY TIME

The 3600A and 3550W Frequency Counters represent a significant new advancement, utilizing the latest LSI Design . . . which reflects DSI's ongoing dedication to excellence in instrumentation, for the professional service technician and amateur radio operator. Before you buy a DSI instrument you know what the specifications are. We publish complete and meaningful specifications which state accuracy over temperature and sensitivity at frequencies you need. And we guarantee those specifications in writing.

MODEL 3550W TCXO

\$149.95

- INCLUDES INTERNAL BATTERY HOLDER
- SAME AS 3600A LESS OVEN
- SEE SPECIFICATIONS BELOW

MODEL 3700 .2PPM 0° - 40°C \$269.95

- AUTO ZERO BLANKING
- AUTO DECIMAL POINT
- INCLUDES ANTENNA

PORTABLE! TAKE IT TO THE MOUNTAINS OR
USE IT MOBILE — TAKE IT WITH YOU ON FIELD DAY

ALL NEW! ALL UNPARALLELED DSI QUALITY! The model 3700 700MHz frequency counter features2 PPM 0° to 40°C proportional oven time base . . . Built in battery trickle charger less batteries . . . Combined in a rugged (.125" thick) aluminum cabinet makes the 3700 ideal for the communications industry, professional service technicians, and sophisticated amateur radio operators.

3600A OWNERS: Update your 3600A frequency counter to a 3700 includes2 PPM proportional oven, rugged .125" thick aluminum cabinet, order 3600-A - 3700. Unit must be returned to DSI factory for modification.

DSI — GUARANTEED SPECIFICATIONS — MADE IN USA

Model	Frequency Range	Accuracy Over Temperature	@ 146MHz	@ 220MHz	@ 450MHz	Number of Readouts	Size of Readouts	Power Requirements	Size
3700	50Hz - 700MHz	Proportional Oven .2 PPM 0° - 40°C	10MV	10MV	50MV	8	.5 Inch	115 VAC or 8.2 - 14.5VDC	3"H x 8"W x 6"D
3600A	50Hz - 600MHz	Oven .5 PPM 17° - 37°C	10MV	10MV	50MV	8	.5 Inch	115VAC or 8.2 - 14.5VDC	2 1/8"H x 8"W x 5"D
3550W	50Hz - 550MHz	1 PPM 65° - 85°F	25MV	25MV	75MV	8	.5 Inch	115VAC or 8.2 - 14.5VDC	2 1/8"H x 8"W x 5"D

— ALL UNITS ARE FACTORY ASSEMBLED, TESTED AND CARRY A FULL 1 YEAR WARRANTY —

- NO EXTRA COSTS •

FREE Shipping anywhere in U.S.A. and Canada.
All other countries, add 10%.

*Strongest warranty in the counter field.
Satisfaction Guaranteed.*

See Your Dealer or

Call Toll Free: (800) 854-2049
DSI INSTRUMENTS, INC.

California Residents, Call Collect: (714) 565-8402
VISA • MC • AMERICAN EXPRESS • CHECK • MONEY ORDER • COD
7914 RONSON ROAD, #G, SAN DIEGO, CA 92111

Model 3700	\$269.95
3600A - 3700 Factory Update (3600A Only) Includes Labor & Re-Calibration	\$ 99.95
Model 3600A	\$199.95
Model 3550W	\$149.95
Option 03 20-Hr. Rechargeable Battery Pack	\$ 29.95

KB CLUB CALENDAR

Steve Fuller

Atlanta GA

The Atlanta Area Microcomputer Hobbyist Club has voted to change its name to the Atlanta Computer Society. Meetings are held in the Community Room of the Decatur Federal Savings and Loan Assn. (Dunwoody Branch), 1630 Mount Vernon Road, Dunwoody GA. Regular meetings are scheduled at 7:30 PM on the last Wednesday of each month. Visitors are welcome, and interested persons may write ACS, PO Box 88771, Atlanta GA 30338, for information on club activities.

Microware Newsletter

Microware Forum is the newsletter of a new users group for Microware products, which include the RT68 multitasking monitor and the ABASIC compiler.

The first issue will include adaptations of the compiler to CRT terminals, printers and the SWTP calculator card. The annual subscription rate is \$10. Write Microware Forum, PO Box 3630, Minneapolis MN 55403.

Tampa FL

Officers of the Tampa Bay Computer Club include President Jack Stevens and Secretary Brian Sherritt. The club meets on the first and third Thursday of each month in the Science Center on the Dale Mabry Campus of Hillsborough Community College.

Write Tampa Bay Computer Club, PO Box 8004, Tampa FL 33604. In Tampa, call Jack at 988-1003 or Dave Smith at 961-2446. In Clearwater or St. Petersburg, call Kirk Bailey at 393-2161.

Holyoke MA

The address of the Western Mass Computer Club is 20 Morgan St., Holyoke MA 01040. The club secretary is Christopher Lyons.

San Jose CA

Persons interested in the use of microprocessors for tracking stock-market activity can write to Jim Finnell at 760 S. Saratoga Ave. Z 101, San Jose CA 95129, or call him at (408) 249-7977.

TRS-80 SIG

The Southeastern Michigan Computer Organization (SEM-CO) is now sponsoring a special-interest group for TRS-80 users. Chairperson Dick Huebner says the group's main objective is to share ideas on programming, troubleshooting and new TRS-80 products.

For meeting locations and club activity information, write to SIG TRS-80, Box 37206, Oak Park MI 48237. Phone numbers are (313) 326-0386 (days) and (313) 548-5926 (nights).

Bedford MA

A sample of the special-interest groups sponsored by the New England Computer Society includes 6502, PET, M6800 and TRS-80 . . . a good start toward satisfying the most avid hobbyist!

For more information on this active club, write New England Computer Society, PO Box 198, Bedford MA 01730.

Mental Health and Micros

Marc Schwartz, MD, is the editor of Micro-Psyche, a bimonthly for professionals interested in microcomputers in the mental health field.

Offerings from a previous issue include hardware/software reviews for psychologists and psychiatrists, use of the microcomputer as a diagnostic tool and continuing bibliography on computers in mental health.

For a membership and subscription send \$10 to Micro-Psyche, 26 Trumbull St., New Haven CT 06511.

Seattle WA

The Northwest Computer Club and the Pacific Science Center will co-sponsor the Second Annual Personal Computer Fair on March 10 and 11, 1979, at the Science Center in Seattle.

The show is specifically geared to acquaint the general public with personal, home and hobby computer applications, and features a variety of nontechnical demonstrations. There are numerous opportunities for hands-on experimentation.

Address inquiries to Susan Stocker, Pacific Science Center, 200 Second Ave. North, Seattle WA 98109, or call (206) 624-8140.

OSI Users Group

Owners and users of Ohio Scientific computers can share information, applications and software through an independent users group formed recently by the Newton Software Exchange in Newton MA. The group will encompass the full range of OSI products, with special attention given to the Challenger series.

Annual dues of \$5 include a subscription to the group's monthly newsletter. Write Newton Software Exchange, PO Box 518, Newton Corner MA 02158.

TRS-80 Newsletter

The TRS-80 Club of Arlington (MA) is preparing a semiannual newsletter, free for an SASE. The group also has a word processing program available for the TRS-80. Write to them at 96 Dothan St., Arlington MA 02174.

VIM and AIM-65

The San Fernando Valley KIM-1 Users Club is broadening its base to include users of VIM and AIM-65 systems, according to club president Jim Zuber.

Write SFV KIM-1 Users Club, 20224 Cohasset No. 16, Canoga Park CA 91306.

This column is available for you to report on your club's activities such as regular meeting schedules, special events or programs, swap meets or any endeavor that will be of interest to your fellow hobbyists. If your announcement contains timely information, please send it at least two months prior to the date or dates mentioned in the announcement.

*Kilobaud Club Calendar
c/o Steve Fuller
334 Sterling St. Unit A-3
West Boylston MA 01583*

Contest!

With this issue, we inaugurate the second year of our "best article of the month" contest. To vote, simply turn to the reader-service card at the back of the magazine.

The winner for October 1978 was Emerson Brooks, author of "Let Your Computer Wear a Watch." Our congratulations to Emerson.

In a drawing of all votes submitted, that of Tom Simon of Chalfont PA was chosen; Tom wins a book from the KB Book Nook.

If you have the December 1978 issue handy, turn to page 79. There you'll find a ballot listing the 12 articles selected as best of each month for the first year of the contest. If you haven't already done so, mark on the December reader-service card in the allotted space the month of the issue that contains your vote for best article of the year. Deadline for submission of votes is January 1, 1979.

LETTERS

Thinking Big about Small Business

I've been an avid reader of *Kilobaud* since the first issue and have been impressed by the down-to-earth and simple approach it has taken. The format has proved to be understandable and interesting, and the Instant Software service should be a smash if it offers complete documentation and well-engineered and tested software.

However, I'm afraid that *Kilobaud* may have chosen, by content and format, a limited marketplace: enthusiast only. That market is now probably peaking out, after the significant inroads accomplished by the \$600 micro.

Enthusiasts probably only exist in the hundreds of thousands. Although this may seem like a huge quantity, it is dwarfed by the millions of very small businesses that should be the real marketplace for the microcomputer and its supporting industries.

Let me explain what I mean by the term "very small business." I'm not talking about the small business with a large information problem, such as a distributor with large and volatile inventory; nor the profession whose business is information, such as accounting; nor the large-size small business that probably has a full accounting and control section already, such as the dental clinic or the larger retailer. These businesses are just waiting for the day they can afford the right computer. Their complex problems require complex solutions, and they will be attacked in full force—by Alpha Microsystems and its competitors with scaled-down (only slightly) versions of mini and maxi-computer systems.

What I'm really talking about is "the little guy," the business that only needs help from the computer and doesn't want to be overwhelmed by technology. This businessman got into his business because he likes what he does. At best he has office help, but it is inexpensive and relatively unskilled in accounting and information handling. He may still even carry his receipts and paperwork to his accountant in a shoe box, anxiously waiting to find out

if he made a profit or is going bankrupt. This businessman has already had the enjoyment of his work infringed upon by overhead, inventory control, lost order, overstocks, out-of-stocks and organization problems.

When he looks for help, it has to simplify his life, not complicate it further or enslave him to a machine. He will have to be able to see the computer as a new tool and friend, just like a typewriter, calculator or cash register, ready to help him improve his profit margin without taking the fun away.

This is where my worries take on frightening proportions. Are we really going to be able to give him what he wants or will he be led on a wild-goose chase, trying this, that and the other thing, until he gets fed up and washes his hands of this "computer thing" completely? (Remember the CB radio, and look at the shelves full of them now.)

I think we can give him what he wants, but we're really going to have to get our act together. Systems are going to have to be simple and understandable, not scaled-down complexities. They will also have to be very simple to operate, not scaled-up computer games.

This will require reaching out and meeting the small businessman on his own ground, with specific solutions to his specific problems. Simplicity, reliability, and my own term, friendliness, will be the key ingredients. If he understands it (simplicity) he'll tell his friends; if it rarely breaks or fails (reliability) he'll think about new uses; and if he likes it and doesn't feel threatened by it (friendliness) he'll enjoy his work and make a profit.

This means that we are going to have to learn his problems and develop relevant solutions. We won't be able to make him think like a programmer, requiring input such as: "ENTER PAY-ROLL INFO? 136721,080,065,L,1,2,A" and we can't force him to do cost accounting when he doesn't want it, or keep an inventory on only ten items.

We are going to find that each small business will insist on its own answers and its own specific

needs and differences. I know we have a challenge ahead. But, I think we have a chance to make it successful. It's just going to take a lot of work and a lot more understanding of the problem.

Larry D. Soderberg
VIS Group
San Luis Obispo CA

Thanks for an interesting letter, Larry. Not only am I aware of the drop in interest in hobby computing, I predicted it. This is why I have been encouraging the writing of business-oriented articles for Kilobaud. My intention is not to turn Kilobaud into a small-business computer magazine, but to lay the groundwork for starting a separate magazine for that market. I see Kilobaud as a magazine for the hobbyist and the person, businessman or no, who wants to learn more about microcomputers. I see it as a step above publications written for those not really interested in learning more about the hardware and programming.

As sales of TRS-80 systems are proving, there are a lot of people who want to use and enjoy computers, but without the commitment of having to learn the intricate electronics and a host of programming languages. Until we are able to find people who want to work on a magazine about such electronics and programming intricacies, we'll aim at taking care of the above users and enjoys to some degree, with Kilobaud.

What kind of articles are needed? We need evaluations of hardware and software from a business point of view, written in English, not computerese. With a new hardware system being announced almost every week, how can businessmen know what each can do or why they should buy them? And now that the first trickle of business-oriented software is coming in sight, how are we to know what can do what without some in-depth reviews by people who are trying to use it in business environments?—Wayne.

What's Up, DOC?

Don Fitchhorn's DOCUFOR article in the August 1978 Kilobaud has elicited much comment, nearly all of it favorable. One commonly asked question was whether or not there was any code missing between lines 390 and 980 of the program listing. The answer is no; DOCUFOR is complete as published in Kilobaud. A bug did creep into the listing,

however, and Don takes care of it below. He also expounds a bit on the AUTO DOC routine.—The Editors.

DOCUFORM could have been the best program I've ever seen in *Kilobaud*. Would you please explain AUTO DOC subroutine 550?

Charley Butler
Lansing MI

In response to Mr. Butler's letter: The subroutine title states that this is the GET A LINE routine, and that is just what it does. This sub could have simply been the statement: 550 PRINTCHR-\$(7);:LINEINPUT B\$:GOTO 700. But I wanted to control how the delete (or rubout) key worked —<670,680>. Also, because tab characters in text are hard to work with, I wanted to replace them with the correct number of spaces—<610>. And last, the column scale would not have worked very well. These three features that I wanted required that I perform my own "LINE INPUT."

Explaining just how this routine works would require several pages. Instead, I will offer a few hints so that (if necessary) you can sit down and figure it out yourself. OUT17,X puts the ASCII character corresponding to the value of X out to the terminal. X=INT(17) puts the ASCII value of the character just typed into X. WAIT16,1 stalls the computer until a character is typed.

I hope that this helps some.

Donald L. Fitchhorn

The purpose of this letter is to comment on the dictionary file scheme of DOCUFOR by Donald L. Fitchhorn. First, I want to commend Mr. Fitchhorn for a fine program, and especially for the hash-coded dictionary. I recommend careful study of this code to any programmer who may have a need for efficient keyword index files for any application. A hash-coded index, such as the one in DOCUFOR, is far more efficient than any sorting scheme, and once the principle is understood, it can easily be coded by using the DOCUFOR program as a model. I also thank Mr. Fitchhorn for including the variable glossary in his article—it makes study of the program much easier.

The DOCUFOR dictionary code, as published, contains a few errors. These are mostly in the record overflow handling part of the code, and therefore would

```

5580 IF GS="DICTIONARY"THEN AA=CVI (AA$):AB=CVI (AB$):GOTO5590
ELSE LSETGS="DICTIONARY":LSETAA$=MK1$ (1.02):LSETAB$=MK1$ (0):PUT4,1:
LSETRS=CHR$ (126):LSETRS$=MK1$ (0):FORM=2TO1.02:PUT4,M:NEXT:GOTO5590
2540 GS=MIDS (RS,1,INSTR (RS,CHR$ (126))-1)
2550 IF LEN (GS)+LEN (FS)<127
THEN LSETRS=GS+FS:PUT#4,P1:
GET4,1:AB=AB+1:LSETAB$=MK1$ (AB):PUT4,1
GOTO2460
2560 AA=AA+1:LSETRS$=MK1$ (AA):PUT#4,P1:LSETRS$=FS:LSETRS$=MK1$ (0):PUT#4,AA:
AB=AB+1:GET#4,1:LSETAA$=MK1$ (AA):LSETAB$=MK1$ (AB):PUT#4,1

```

Example A.

not soon show up in normal usage. Statistically, about 700 to 800 long English words would have to be entered into this dictionary before the first overflow would occur. For those readers not familiar with the statistics of hash-coding, one of the advantages is that the initial file space has to be nearly filled before any overflow becomes probable, if randomly chosen words are entered.

Sylvan Rubin
Santa Clara CA

When I received Sylvan Rubin's letter, I was surprised. I knew that this problem had already come up and had been fixed. On looking back at the old listings, I found that only part of the fix had actually gotten into the program. Apparently, this is a case of being called way from an editing session and upon return (finding that everything seemed to work OK) deciding that I had gotten farther than I thought. My apologies to all of you who are using the program.

To fix the problem stated in the letter, the changes in Example A should be made. Changes are underlined.

Further correspondence on DOCUFORM may be addressed directly to me at 2475 Calle Pino, Thousand Oaks CA 91360. For \$5 I will send a listing of the latest version of DOCUFORM with all bug fixes noted.

Donald L. Fitchhorn

Afterthoughts

With reference to the "Do It with a Kimsi" article in the November 1978 issue, we would like to clear up one point that may cause some confusion. The Kimsi board was designed to plug directly onto KIM's expansion connector using the "back-to-back" connectors that are available for this purpose. A 6-8 inch cable may optionally be fabricated between the two units as the user wishes. The suggestion to lower the clock speed of the KIM applies ONLY to users who must

use cables longer than 8 inches; absolutely no modifications to KIM are needed for normal use with Kimsi. We should also note that the Kimsi *does* fully buffer the address and data lines, both to the S-100 bus, and to the KIM.

With the KIM-1 now only \$179, a complete Kimsi system can be put together for considerably less than mentioned in the article. Of course, the real value in a Kimsi system is the instant S-100 expansion that isn't available in "all-in-one" machines.

As we have just moved to new facilities, correspondence should be sent to the address below rather than the one in the article.

Forethought Products
87070 Dukhobar Road
Eugene OR 97401

Leonard Crane
Forethought Products

Just received the November issue. After checking out my article on page 60 I found a "BOO-BOO." I made an error in the original copy. The statement "This was necessary because there is no buffering in the Kimsi of the address and data lines going to KIM" should read, "This was necessary because there is no buffering in the KIM of the address and data lines going to the Kimsi." The Kimsi does have adequate buffering on its board, and I would like pass this information along to the readers.

Rick Grossman
Lompoc CA

PROM 'n' Aid

In the September 1978 issue of *Kilobaud* I noted "Super Cheap 2708 Programmer" by James Grina.

This is a good article and the type I am looking for. It was also timely since I had decided to do a 2708 and also an 8748 programmer using the KIM-1.

In studying the program listing in order to make a few minor changes (such as programming by the page), I focused on the 1 millisecond delay (line 008A). It seems

DELAY	LDX #\$F8	Load 248 Dec.
C1	DEX	2 cycles
	BNE C1	3 cycles Total 5 cycles

Example 1.

008A A2C7 DELAY LDX #\$C7 Delay for 1 millisecond

Example 2.

Code Correction

0056	CE	02	17
0059	20	90	00
005C	90	E9	
005E	F0	EA	

Can America Go Metric?

I enjoyed the September 1978 article on "metric-American conversion" (p. 46). However, I discovered a few mistakes in the conversion formulas Mister Ferguson used. I have included a list of formulas that have been checked against college and commercial conversion tables for accuracy.

0450	M = K/1.6093440
0500	F = M/0.30480
0550	I = C/2.540
0600	K = M*1.6093440
0650	M = F*0.30480
0700	C = I*2.540
0890	M = K/2.58998811
0940	F = M/0.09290304
0990	I = C/6.451600
1040	K = M*2.58998811
1090	M = F*0.09290304
1140	C = I*6.451600
1330	I = C/16.387064
1380	F = M/2.831684659 E - 02
1430	G = L/3.785411784
1480	C = I*16.38706400
1530	M = F*2.831684659 E - 02
1580	L = G*3.785411784
1770	O = G/28.34952313
1820	P = K/.45359237
1870	T = M/.90718474
1920	G = O*28.34952313
1970	K = P*.45359237
2020	M = T*.90718474

(All numbers are given to ten significant figures.)

John H. Richardson, Jr.
New York NY

The letter from Mr. Richardson is the second I have received about apparent errors in the metric-American conversions.

As to the accuracy of the conversions, I am by no means an authority on the metric system. So I simply took the conversion formulas from *The Calculator Handbook* by A. N. Feldzamen, PhD, and Faye Henle, which happened to be sitting on my desk. I've double-checked the conversion formulas in the article against *The Calculator Handbook* and they agree. Since I do not have either college or com-

Jim Grina
St. Paul MN

mercial conversion tables, *Handbook* was my best source. I simply assumed Feldzamen & Henle had done their homework.

The number of significant digits used in the conversion formulas was that which was given in the *Handbook* and should be sufficient for most personal-computer applications. After all, MITS 8K BASIC has only six significant digits, and SWTP BASIC has nine.

I do hope this has not caused anyone any serious inconvenience. If so, I am very sorry. I also offer an apology, if necessary, on behalf of *The Calculator Handbook* people.

Mickey Ferguson
Trenton GA

A Blow for Standardization

Thank you for publishing my article about a BASIC program for copying Morse code in the November 1978 issue (p. 34). I have been contacted by many hams who have operated the program successfully.

However, I have discovered that some versions of BASIC have differences from the Microsoft BASIC in which the program was written. Specifically, in Microsoft BASIC if there are multiple statements on a line separated by a colon (:), and if the first IF statement is not

satisfied, the rest of the statements are not executed. In some other versions of BASIC, the rest of the statements are executed.

In the program, the line in Example a appears. For non-Microsoft BASIC users, the changes in Example b should be made.

The simple addition of line 25 and the minor modification of line 30 takes care of all variations of BASIC. Anyway, another blow is pounded for the need for standardization.

Robert Kurtz
Rolling Hills CA

"Action" . . . Elucidation

Robin McDaniel of Oswego IL and Roger S. Hicks of Atlanta GA (among others) indicated that they had problems with the program in "Action on the Enterprise" (October 1978, p. 78). Following is a letter from the author, Ed Juge, regarding the program.

Regarding "Action on the Enterprise": I have been through the program a couple of times and have talked to several people who have called on the phone. The mistakes I have found are as follows.

1. Line 200—there should be a comma following "P.A.710"
2. Line 2252—this line number appears twice. The second

30 IF A = 1 THEN C = ((5*C) + (2*B))/6:DO = 2*DO:DA = 2*DA:DO = DO + 1:GOTO 100

Example a.

25 IF A = 0 THEN 40

30 C = ((5*C) + (2*B))/6:DO = 2*DO:DA = 2*DA:DO = DO + 1:GOTO 100

Example b.

Reader Responsibility

One of your responsibilities, as a reader of *Kilobaud*, is to aid and abet the increasing of circulation and advertising, both of which will bring you the same benefit: a larger and even better magazine. You can help by encouraging your friends to subscribe to *Kilobaud*. Remember that subscriptions are guaranteed—money back if not delighted, so no one can lose. You can also help by tearing out one of the cards just inside the back cover and circling the replies you'd like to see: catalogs, spec sheets, etc. Advertisers put a lot of trust in these reader requests for information. To make it even more worth your while to send in the card, a drawing will be held each month and the winner will get a lifetime subscription to *Kilobaud*!

Ring in the new year with resolutions of responsible readership, and you may find yourself in the same position as James S. Conger of Modesto CA. James has won a lifetime subscription to *Kilobaud* in our latest drawing.

line should read "2255 N.B"

3. Line 4040—there should be only a comma following the second A. (There are a period and comma following that A.) The beginning of the line should read 4040 P.A. A, "**"

Regarding the note by Robin McDaniel and the comment that line 334 should have "Y=83" (my program reads X=83): I do not agree with that comment.

Ed Juge
Burleson TX

authorized for repairs. If you bought it directly from Commodore, ship it back to them for repairs. Use the original container, but add more solid cushioning, such as newspapers, especially in the corners. Don't use small pieces of Styrofoam. Ship it via UPS to: Commodore, Customer Services, 901 California Ave., Palo Alto CA 94304. Commodore's customer-services phone number is (415) 327-4030.

By now every PET owner should have received a revised PET user manual, a booklet titled "PET Communication with the Outside World," two programs, "Squiggle" and "Bigtime," on a cassette tape, including a booklet explaining the programs, and a machine-language monitor on cassette with a booklet explaining how to use it. If you did not receive yours, write to inquire if your name was left off the list.

To function reliably your tape heads should be properly aligned, cleaned and demagnetized every ten hours of use. Sure, for a few hundred dollars you can buy a screen printer for the TRS-80 and run off a print of records for use as an audit trail later on. But why get into the paper-filing business if you really don't have to?

Most audit-trail records are never needed . . . they are kept "just in case." So why put them on sheets of paper and file them for such an iffy use? How about getting your data on your TRS-80 screen and shooting it with a 35 mm camera on black and white film . . . and then having a contact print made of each 36 pages of records? In this way 36 pages would be on one 8 x 10 contact print. Sure, you'll have to use a magnifying glass to read the tiny print, but remember that this is for emergency use.

If you get into a spot where you need to use the records and don't want to bother with the magnifying glass you can trot out a 35 mm projector and look at 'em . . . or even have enlargements made.

Demagnetizing your tape heads is also easy, but requires a "Demagnetizer." These can be purchased at most stereo stores for under \$10. Make sure that no cassettes are within five feet of the demagnetizer or they can be ruined. Turn on the demagnetizer three feet away from your tape heads and slowly bring the tip of it towards the heads until you gently touch them. Now slowly bring the demagnetizer away from the recorder. Don't turn it off until you are three feet away again.

Well, that's it for the first installment. I look forward to producing future columns, and I look forward to hearing from PET owners, users and readers interested in the PET microcomputer. Please address all correspondence—questions, problems, suggestions, news, etc.—to:

Len Lindsay
Microcomputer Resources Ctr.
1929 Northport Dr., Rm. 6
Madison WI 53704

PUBLISHER'S REMARKS

(from page 8)

there must be an alternative to the printer as a means of keeping a permanent record of data. Sure, for a few hundred dollars you can buy a screen printer for the TRS-80 and run off a print of records for use as an audit trail later on. But why get into the paper-filing business if you really don't have to?

Most audit-trail records are never needed . . . they are kept "just in case." So why put them on sheets of paper and file them for such an iffy use? How about getting your data on your TRS-80 screen and shooting it with a 35 mm camera on black and white film . . . and then having a contact print made of each 36 pages of records? In this way 36 pages would be on one 8 x 10 contact print. Sure, you'll have to use a magnifying glass to read the tiny print, but remember that this is for emergency use.

If you get into a spot where you need to use the records and don't want to bother with the magnifying glass you can trot out a 35 mm projector and look at 'em . . . or even have enlargements made.

PET POURRI

(from page 11)

PET Problems

If your PET has a problem, take it to your dealer; he is

Our instructor, Pete Stark, is on "sabbatical" this month, so we're presenting a couple of articles by Pete in lieu of Klassroom No. 16, which will appear next month.—Editors.

An Editor for 6800 BASIC Programs

This is one of the most significant and useful pieces of software owners of SWTP systems will see in quite some time (especially those who do a lot of programming in BASIC).

Peter A. Stark
PO Box 209
Mt. Kisco NY 10549

Considering the difference in price between a small computer such as the SWTP 6800 system, and a large computer such as an IBM 370 or PDP-10, the small-computer BASIC systems are remarkably capable in comparison. There has been a tremendous improvement in the last year or so in the power of microcomputer BASICs, including even various formatted outputs and cas-

sette and disk routines. But there is one area in which the big-computer BASIC systems outshine the small—the facility to edit the BASIC source program easily and quickly. Here are two programs for the SWTP system that help with the editing job.

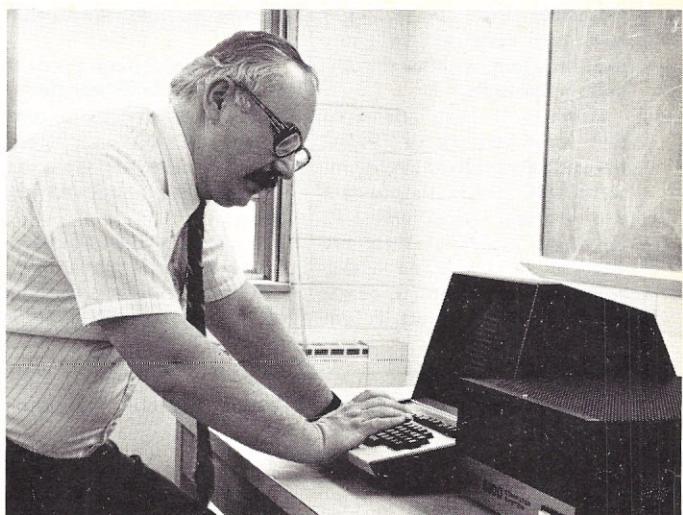
The two programs are called BASEDIT and BASLIST. There are overlapping areas between the two; they could probably have been combined into one larger program, but I chose to separate them because I could not assemble them together in my 16K system.

Program 1. BASEDIT program.

```

00010      NAM    BASEDIT
00020      *BASIC EDITOR
00030      *P. STARK 2/78
00040 0100      ORG    $0100
00050      OPT    0
00060      *ROM ENTRY POINTS
00070  EIA1      INEE1  EQU    $E1AC
00080  EID1      OUTEE1 EQU    $E1D1
00090  EOE3      CONTRL EQU    $EOE3
00100      *HARD/SOFT STARTS
00110 0100 7E 0106 HARDST JMP    START
00120 0103 7E 012A SOFTST JMP    ASK
00130 0105 CE 0103 START  LDX    #$0103
00140 0109 FF A048 STX    $A048
00150 010C 8E A042 LDS    #$A042
00160      *START WITH LF
00170 010F 86 0A LDA    A #$0A
00180 0111 B7 0498 STA    A TEXT
00190 0114 CE 0499 LDX    #TEXT+1
00200 0117 8D 43 BSR    CRLF
00210 0119 BD E1AC READ  JSR    INEE1
00220 011C A7 00 STA    A 0,X
00230      *EXIT ON CTRL E
00240 011E B1 05 CMP    A #$05
00250 0120 27 08 BEQ    ASK
00260 0122 08 INX
00270 0123 FF 0128 STX    LAST
00280 0126 20 F1 BRA    READ
00290 0128 0002 LAST  RMB    2
00300      *ENTER COMMAND
00310 012A 8E A042 ASK   LDS    #$A042
00320 012D 8D 2D BSR    CRLF
00330 012F 86 3E LDA    A #'>

```



Pete Stark... hard at it.

Both programs take as their input a cassette tape of the BASIC source program in the format produced by Version 2.0 (and possibly later versions) of the SWTP 8K BASIC. BASEDIT allows editing of the program and then produces a new cassette (or listing) in the same format, so that the program can be fed back into the BASIC interpreter. BASLIST reads a tape and produces a neatly formatted listing separated into pages, each of which is numbered and has an optional program title.

The BASEDIT Program

BASEDIT is a machine-lan-

guage program that lies in locations 0100 through 0497 hex, and uses the rest of memory, from location 0498 hex up through the limit of RAM, to store the BASIC source program to be edited. It has a starting address of 0100 hex, and a 0103 soft-start address that allows BASEDIT to be restarted without erasing the BASIC program from memory.

When BASEDIT is started at the hard-start address of 0100, it immediately goes into its read mode, where all characters entered from the keyboard or tape are stored into memory in the text buffer. Normally, you would start BASEDIT at 0100,

either by loading A048 with 0100 and then typing G with MIKBUG, or typing J 0100 for SWTBUG. BASEDIT then does a carriage return and waits for text. At this point, you should switch to cassette input, and load a standard BASIC program exactly as it was recorded by the BASIC interpreter with its SAVE command.

BASIC programs in this format consist of a chain of 00 (Null) codes, a set of BASIC statement lines, an end code using a 03 code (ETX or Ctrl-C) and another string of 00 (Null) codes. Each line, consisting of 02 (STX or Ctrl-B), a four-digit line number, one space and the BASIC source text, is output by the interpreter in line-number order. This is the format BASEDIT needs.

When the source program is finished reading, turn off the cassette and switch back to keyboard input, and enter a Ctrl-E from the keyboard (hex 05) to signify the end of the program. BASEDIT then goes into the command mode, prints a > and waits for a command.

There are five possible editing commands; each is a single letter (E, P, F, R or S) possibly followed by one or two arguments.

1. E. Typing an E(Exit) returns control to MIKBUG or SWTBUG. BASEDIT leaves an address of 0103 in A048 and A049, so the program can be restarted either by typing G or J 0103. Either way, the program being edited will remain. If a new program is to be entered, then BASEDIT should be restarted at 0100.

2. P. Typing the P command (for Print) outputs the BASIC text as it has been stored or modified. The output begins as soon as the P is entered, without any intervening delays; it is assumed that the null characters read in from the source tape will provide the necessary delays before and after the text.

The P command can be used to simply print out the program, or, if the cassette recorder is on, then the program will be written to cassette in a format suitable for reading into the BASIC system with the LOAD

command. To stop output in the middle of the program, simply press the reset button on the computer's front panel, and then restart from location 0103.

3. F. Typing the letter F (for Find), followed by a string of up to 40 characters, will print out all lines in the text that contain that string. The string must be preceded and followed by a delimiter character, which may be any character on the keyboard except for a carriage return (CR) or any character that appears in the string itself.

For example, the command F.PRINT. prints out all lines that contain the string PRINT; in this case the delimiter is a period. Since any character can be a delimiter, typing FXGOTOX prints out all lines that contain the string GOTO; in this case an X is the delimiter.

The Find command can also be used to print out specific lines or sections of the BASIC program being edited. Since each line of the BASIC program starts with a Ctrl-B character, followed by a four-digit line number, this can be part of the string to be found.

For instance, entering the command F 'b0140' (where b stands for Ctrl-B) prints out only line 0140 of the source program. Or, the command F 'b05' prints out all lines whose line numbers start with 05, that is, lines 0500 through 0599. This is, of course, most useful if the keyboard can generate the Ctrl-B code; if not, then more lines will be printed. For instance, the command F '0140' prints out not only line number 0140, but also all other lines which contain the string 0140.

4. R. The command R stands for Replace, and it allows any string to be replaced by another string throughout the program. The format for the R command is: R, a delimiter, the first (old) string, the same delimiter, the second (new) string and the same delimiter again. The delimiter follows the same rules as in the F command, and the two strings together may not exceed 40 characters. The two strings need not be the same length; the second string

```

00340 0131 BD E1D1 JSR OUTEEE
00350 0134 BD 31 BSR SPACE
00360 0136 BD E1AC JSR INEEE
00370 0139 81 50 CMP A #'P
00380 0138 26 03 BNE NOTP
00390 013D 7E 0201 JMP PRINT
00400 0140 81 46 NOTP CMP A #'F
00410 0142 26 03 BNE NOTFIN
00420 0144 7E 0218 JMP FIND
00430 0147 81 52 NOTFIN CMP A #'R
00440 0149 26 03 BNE NOTR
00450 014B 7E 0246 JMP REPLAC
00460 014E 81 53 NOTR CMP A #'S
00470 0150 26 03 BNE NOTS
00480 0152 7E 02EF JMP SEQUEN
00490 0155 81 45 NOTS CMP A #'E
00500 0157 26 D1 BNE ASK
00510 0159 7E E0E3 JMP CONTRL
00520 *CR/LF PRINT SUBR
00530 015C 86 0D CRLF LDA A #$0D
00540 015E BD E1D1 JSR OUTEEE
00550 0161 86 0A LDA A #$0A
00560 0163 BD E1D1 JSR OUTEEE
00570 0166 39 RTS
00580 *PRINT SPACE SUBR
00590 0167 86 20 SPACE LDA A #$20
00500 0169 BD E1D1 JSR OUTEEE
00610 016C 39 RTS
00620 *READ STRING SUBR
00630 016D BD E1AC READST JSR INEEE
00640 0170 11 CBA
00650 0171 27 09 BEQ EXITRS
00660 0173 81 0D CMP A #$0D
00670 0175 27 05 BEQ EXITRS
00680 0177 A7 00 STA A 0,X
00690 0179 08 INX
00700 017A 20 F1 BRA READST
00710 017C 39 EXITRS RTS
00720 *FIND STRING SUBR
00730 017D A5 00 FINDST LDA A 0,X
00740 017F B1 01C4 CMP A STRING
00750 0182 27 09 BEQ FOUND1
00760 0184 08 FCONT INX
00770 0185 BC 0128 CPX LAST
00780 0188 26 F3 BNE FINDST
00790 018A C6 00 LDA B #0
00800 *B=0 IF NOT FOUND
00810 018C 39 RTS
00820 *FOUND 1ST CHAR; CHECK MORE
00830 018D FF 01BE FOUND1 STX SAVEX
00840 0190 FF 01C0 STX TEMP$0
00850 0193 CE 01C4 LDX #STRING
00860 0196 FF 01C2 STX TEMP$T
00870 0199 FE 01C0 FLOORPI LDX TEMP$0
00880 019C A6 00 LDA A 0,X
00890 019E 03 INX
00900 019F FF 01C0 STX TEMP$0
00910 01A2 FE 01C2 LDX TEMP$T
00920 01A5 E6 00 LDA B 0,X
00930 01A7 08 INX
00940 01A8 FF 01C2 STX TEMP$T
00950 01AB 11 CBA
00960 01AC 26 0B BNE NOTF
00970 01AE BC 01EC CPX SPOINI
00980 01B1 26 E6 BNE FLOORPI
00990 01B3 FE 01BE LDX SAVEX
01000 01B6 C6 01 LDA B #1
01010 *B=1 IF FOUND
01020 01B8 39 RTS
01030 01B9 FE 01BE NOTF LDX SAVEX
01040 01BC 20 C6 BRA FCONT
01050 01BE 0002 SAVEX RMB 2
01060 01C0 0002 TEMP$0 RMB 2
01070 01C2 0002 TEMP$T RMB 2
01080 01C4 0028 STRING RMB 40
01090 01EC 0002 SPOINI RMB 2
01100 01EE 0002 SPOIN2 RMB 2
01110 *GET DELIM & STRING SUBR
01130 01F0 BD 0167 DELIM JSR SPACE
01140 01F3 BD E1AC JSR INEEE
01150 01F6 16 TAB
01160 01F7 CE 01C4 LDX #STRING
01170 01FA BD 016D JSR READST
01180 01FD FF 01EC STX SPOINI
01190 0200 39 RIS
01200 *PRINT TEXT
01210 0201 BD 015C PRINT JSR CRLF
01220 0204 CE 0498 LDX #TEXT
01230 0207 A6 00 PLOOP LDA A 0,X
01240 0209 BD E1D1 JSR OUTEEE
01250 020C 08 INX
01260 020D BC 0128 CPX LAST
01270 0210 26 F5 BNE PLOOP
01280 0212 BD 015C JSR CRLF
01290 0215 7E 012A JMP ASK
01300 *FIND DESIRED STRING
01310 0218 BD D6 FIND BSR DELIM
01320 021A BD 0167 JSR SPACE
01330 021D CE 0493 LDX #TEXT
01340 0220 BD 017D FLOORPI JSR FINDST
01350 0223 5D TST B
01360 *QUIT IF NOT FOUND
01370 0224 26 03 BNE LOOKLF
01380 0226 7E 012A JMP ASK
01390 *BACKSPACE TO LF
01400 0229 09 LOOKLF DEX
01410 022A A6 00 LDA A 0,X
01420 022C B1 0A CMP A #$0A
01430 022E 26 F9 BNE LOOKLF

```

```

01440 0230 BD 015C      JSR      CRLF
01450 0233 08          INX
01460 *PRINT TO NEXT LF
01470 0234 A6 00          FPRLP  LDA A, 0,X
01480 0236 81 0A          CMP A, #$0A
01490 0238 27 E6          BEQ    FLOOP
01500 023A BD E1D1          JSR    OUTEEE
01510 023D 08          INX
01520 023E BC 0128          CPX    LAST
01530 0241 26 FI          BNE    FPRLP
01540 0243 7E 012A          JMP    ASK
01550 *SUBSTITUTE NEW STRING
01560 0246 3D A3          REPLAC BSR  DELIM
01570 0248 BD 016D          JSR    READST
01580 024B FF 01EE REPL2  STX  SPOIN2
01590 024E BD 0167          JSR    SPACE
01600 0251 4F          CLR A
01610 0252 BD 13          BSR  CALCDF
01620 0254 CE 0498          LDX  #TEXT
01630 0257 BD 017D RLOOP3  JSR  FINDST
01640 025A 5D          TST B
01650 025B 27 07          BEQ  GOASK
01660 025D BD 1A          BSR  SWITCH
01670 025F FE 01BE          LDX  SAVEX
01680 0262 20 F3          BRA  RLOOP3
01690 0264 7E 012A GOASK  JMP  ASK
01700 *SUBR TO COMPARE STRING LENGTHS
01720 0267 4A          CALCDF DEC A
01730 0268 09          DEX
01740 0269 BC 01EC          CPX  SPOINI
01750 026C 26 F9          BNE  CALCDF
01760 026E 4C          RLOOP2 INC A
01770 026F 09          DEX
01780 0270 BC 01C4          CPX  #STRING
01790 0273 26 F9          BNE  RLOOP2
01800 0275 B7 02E6          STA A COMPAR
01810 0278 39          RTS
01820 *SUBROUTINE TO SWITCH OLD FOR NEW
01830 0279 B6 02E6          SWITCH LDA A COMPAR
01840 027C 27 44          BEQ  SAME
01850 027E 2A 21          BPL  SHRINK
01860 *NEW STRING LONGER
01870 0280 40          STREIC NEG A
01880 0281 B7 028A          STA A MOVETO+1
01890 0284 FE 0128          LDX  LAST
01900 0287 E5 00          RLOOP4 LDA B, 0,X
01910 0289 E7 00          MOVETO STA B, 0,X
01920 028B 09          DEX
01930 028C BC 01BE          CPX  SAVEX
01940 028F 26 F6          BNE  RLOOP4
01950 0291 BB 0129          ADD A LAST+1
01960 0294 B7 0129          STA A LAST+1
01970 0297 B6 0128          LDA A LAST
01980 029A 39 00          ADC A #0
01990 029C B7 0128          STA A LAST
02000 029F 20 21          BRA  SAME
02010 *NEW STRING SHORTER
02020 02A1 B7 02A8          SHRINK STA A MOVEFR+1
02030 02A4 FE 018E          LDX  SAVEX
02040 02A7 E5 00          MOVEFR LDA B, 0,X
02050 02A9 E7 00          STA B, 0,X
02060 02AB 08          INX
02070 02AC BC 0128          CPX  LAST
02080 02AF 26 F6          BNE  MOVEFR
02090 02B1 B6 0129          LDA A LAST+1
02100 02B4 30 02E6          SUB A COMPAR
02110 02B7 B7 0129          STA A LAST+1
02120 023A B6 0123          LDA A LAST
02130 023D 82 00          SBC A #0
02140 023F B7 0123          STA A LAST
02150 *STRINGS SAME LENGTH
02160 02C2 FE 01EC SAME  LDX  SPOINI
02170 02C5 FF 02E7  STX  TEMP
02180 02C8 3C 01EE          CPX  SPOIN2
02190 02CB 26 01          BNE  SMLOOP
02200 02CD 39          RTS
02210 02CE A6 00          SMLOOP LDA A, 0,X
02220 02D0 FE 01BE          LDX  SAVEX
02230 02D3 A7 00          STA A, 0,X
02240 02D5 08          INX
02250 02D6 FF 01BE          STX  SAVEX
02250 02D9 FE 02E7          LDX  TEMP
02270 02DC 08          INX
02280 02DD FF 02E7          STX  TEMP
02290 02E0 BC 01EE          CPX  SPOIN2
02300 02E3 26 E9          BNE  SMLOOP
02310 02E5 39          RTS
02320 02E6 0001          COMPAR RMB  1
02330 02E7 0002          TEMP  RMB  2
02340 02E9 0004          LINENO RMB  4
02350 02ED 0002          SAVEX RMB  2
02360 *RESEQUENCE LINES STARTING WITH 0010
02370 02EF BD 015C SEQUEJ JSR  CRLF
02380 *SET LINE NUMBER TO 0000
02390 02F2 36 30          LDA A, #'0
02400 02F4 B7 02E9          STA A LINENO
02410 02F7 B7 02EA          STA A LINENO+1
02420 02FA B7 02EB          STA A LINENO+2
02430 02FD B7 02EC          STA A LINENO+3
02440 0300 CE 0498          LDX  #TEXT
02450 *PROCESS EACH LINE OF SOURCE
02460 *LOOK FOR NEXT STX
02470 0303 A6 00          SQLOOP LDA A, 0,X
02480 0305 81 02          CMP A, #$02
02490 0307 27 09          BEQ  GOTSTX
02500 0309 08          INX
02510 030A BC 0128          CPX  LAST
02520 030D 26 F4          BNE  SQLOOP
02530 030F 7E 047B GODONE JMP  DONE

```

may even be what is often called "the null string"—that is, it need not exist. In this case, the first string is simply deleted wherever it occurs.

For example, typing R.THEN..GO TO. simply replaces all occurrences of THEN with the words GO TO. If the old and new strings are the same length, then the replacement, even for long programs, is almost instantaneous; if they are different lengths, then it takes a bit longer. For example, the command R .THEN.. removes all THENs and closes up the empty spaces. If there are many occurrences of THEN, then it may take a few seconds for the job to be complete.

The Replace command is very useful for changing messy BASIC programs into neat ones; I have used it often to straighten up programs for publication. For instance, the BASIC statement

1000 IFA = 2GOTO30

is perfectly acceptable, but difficult to read. It can be changed to

1000 IF A = 2 GO TO 30

for better appearance.

In a program that has many such statements, it is a simple matter to fix them all with the R command. For example, the following sequence of commands unpacks the GOTO and inserts spaces before and after each.

R .GOTO. GO TO .

R . GO TO. GO TO.

R .GO TO .GO TO.

The first command inserts extra spaces as shown. Just in case some GOTOS already had spaces before or after them and now have two spaces, the last two commands replace any occurrence of GO TO with two spaces either before or after it with just one space. A similar set of commands provides spaces around the IF and equal signs.

Another use for the R command is to change variable names. For example, if the variable N9 is to be replaced by N, use the command F .N9.N.

The F command is extremely powerful, but it does require a bit of care. For example, the total length of the old plus the

new string must be 40 characters or less. If a very long string is to be replaced by another long string, it may sometimes be necessary to first replace the old string with a dummy string such as (), and then replace the string () with the new string. Of course, the F command should first be used to check that the string () did not exist in the original program, or else the result may not be exactly what you wanted!

5. S. The most powerful (and most difficult) command to implement is the S, or Sequence, command. The S command resequences all line numbers of the program to start with the number 0010 and increment in steps of 10.

The Sequence command not only changes the line number of each line, but it also corrects all references to line numbers in the program itself. All IF, GO TO, GOSUB and ON . . . GO TO statements are updated to refer to the new line numbers. Thus, the modified program will run after resequencing. (The S command is pretty smart, but there are two things it will not catch. A reference to a line number in a REMark statement may not be updated correctly, and a line reference inside a PRINT—as in PRINT "NOW EXECUTING LINE 100"—will also not be changed.)

The most common use for the S command is to renumber a program that has been extensively modified to open up the line numbers for further modification. It can also be used by "neatniks" (like me) who want people to think their programs were written right the first time and did not need any additions or deletions! The Sequence command was the main reason for my writing BASEEDIT; all other functions are simply by-products. Sequence uses F for finding references in the program to line numbers being changed, and then uses R to change them.

Fig. 1 shows a simple example of using BASEEDIT to edit a program. Assuming that a BASIC program has been read from a cassette, we start by printing it with the P command.

02540 *GOT A STX
 02550 0312 03 GOTSTX INX
 02560 0313 BC 0128 CPX LAST
 02570 0316 27 F7 BEQ GODEONE
 02580 0318 A6 00 LDA A 0,X
 02590 *FOR CONTROL CHARACTERS, SKIP
 02600 031A 81 30 CMP A #'0
 02610 031C 2D F4 BLT GOTSTX
 02620 *FOR LETTERS, GO TO NEXT LINE
 02630 031E 81 39 CMP A #'9
 02640 0320 2E E1 BGT SQLOOP
 02650 *GOT FIRST DIGIT OF LINE NUMBER
 *INCREMENT NEW LINE NUMBER
 02660 0322 FF 02ED STX SAVESX
 02680 0325 CE 02EC LDX #LINENO+3
 02690 0328 09 SLOOP2 DEX
 02700 0329 A6 00 LDA A 0,X
 02710 032B 4C INC A
 02720 032C A7 00 STA A 0,X
 02730 032E 81 3A CMP A #53A
 02740 0330 26 06 BNE LNOK
 02750 0332 86 30 LDA A #'0
 02760 0334 A7 00 STA A 0,X
 02770 0336 20 F0 BRA SLOOP2
 02780 *SUBSTITUTE NEW LINE NUMBER
 02790 0338 CE 01C4 LNOK LDX #STRING
 02800 033B FF 01EC STEX SPOINI
 02810 033E CE 02E9 LDX #LINENO
 02820 0341 FF 0489 STEX SAVELX
 02830 0344 7F 048B CLR ZFLAG
 02840 0347 C6 04 LDA B #4
 02850 0349 FE 02ED LDX SAVESX
 02860 034C A6 00 SLOOP3 LDA A 0,X
 02870 034E 7D 048B TST ZFLAG
 02880 0351 26 07 BNE SSTORE
 02890 0353 81 30 CMP A #'0
 02900 0355 27 0C BEQ SSUBST
 02910 0357 7C 048B INC ZFLAG
 02920 035A FE 01EC SSTORE LDX SPOINI
 02930 035D A7 00 STA A 0,X
 02940 035F 08 INX
 02950 0360 FF 01EC STEX SPOINI
 02960 0363 FE 0489 SSUBST LDX SAVELX
 02970 0366 A6 00 LDA A 0,X
 02980 0368 08 INX
 02990 0369 FF 0489 STEX SAVELX
 03000 036C FE 02ED LDX SAVESX
 03010 036F A7 00 STA A 0,X
 03020 0371 08 INX
 03030 0372 FF 02ED STEX SAVESX
 03040 0375 5A DEC B
 03050 0376 26 D4 BNE SLOOP3
 03060 *SUBSTITUTED NEW LINE NUMBER FOR OLD
 *NOW SEARCH FOR OLD LINE NUMBERS IN TEXT
 03070 0378 CE 0498 LDX #TEXT
 03090 037B BD 017D SLOOP4 JSR FINDST
 03100 037E 5D TST B
 03110 *GO ON TO NEXT LINE IF NO REFERENCES
 03120 037F 26 06 BNE GOTLN
 03130 0381 FE 02ED LDX SAVESX
 03140 0384 7E 0303 JMP SQLOOP
 03150 *FOUND REFERENCE TO LINE;
 *NEXT MUST NOT BE A DIGIT
 03170 0387 FE 01C0 GOTLN LDX TEMPSO
 03180 038A A6 00 LDA A 0,X
 03190 038C 81 30 CMP A #'0
 03200 038E 2D 06 BLT LNOK1
 03210 0390 81 39 CMP A #'9
 03220 0392 2E 02 BGT LNOK1
 03230 0394 20 E5 BRA SLOOP4
 03240 *IS IT PRECEDED BY GOTO, GOSUB, OR THEN?
 03250 0396 FE 01BE LNOK1 LDX SAVEX
 03260 0399 7F 048B CLR ZFLAG
 03270 039C 09 LNOK2 DEX
 03280 039D A6 00 LDA A 0,X
 03290 039F 81 30 CMP A #'0
 03300 03A1 27 F9 BEQ LNOK2
 03310 03A3 81 20 CMP A #520
 03320 03A5 27 F5 BEQ LNOK2
 03330 *LOOK FOR COMMA IN ON...GOTO
 03340 03A7 81 2C CMP A #',
 03350 03A9 26 05 BNE NCOMMA
 03360 03AB 7C 048B INC ZFLAG
 03370 03AE 20 EC BRA LNOK2
 03380 *CHECK IF COMMA EXISTED BEFORE
 03390 03B0 7D 048B NCOMMA TST ZFLAG
 03400 03B3 27 0E BEQ LASTLT
 03410 03B5 81 05 CMP A #505
 03420 03B7 27 E3 BEQ LNOK2
 03430 03B9 81 30 CMP A #'0
 03440 03B8 2D 06 BLT LASTLT
 03450 03BD 81 39 CMP A #'9
 03460 03BF 2E 02 BGT LASTLT
 03470 03C1 20 D9 BRA LNOK2
 03480 03C3 FF 048C LASTLT STEX SAVERX
 03490 03C6 81 4F CMP A #'0
 03500 03C8 27 14 BEQ LGOTO
 03510 03CA 81 42 CMP A #'B
 03520 03CC 27 1E BEQ LGOSUB
 03530 03CE 81 4E CMP A #'N
 03540 03D0 27 13 BEQ LTHEN
 03550 *NO GOTO, THEN, OR GOSUB
 *SO KEEP LOOKING
 03560 03D2 FE 01BE FAIL LDX SAVEX
 03580 03D5 08 INX
 03590 03D6 BC 0128 CPX LAST
 03600 03D9 26 A0 BNE SLOOP4
 03610 03DB 7E 047B JMP DONE
 03620 *FOUND AN 0, LOOK FOR GOT

03630 03DE C6 03 LGOTO LDA B #3
 03640 03E0 CE 0491 LDX #GOTSTR+3
 03650 03E3 20 OC BRA LOOKGO
 *FOUND AN N, LOOK FOR THE
 03660 03E5 C6 03 LTHEN LDA B #3
 03680 03E7 CE 0498 LDX #THENST+3
 03690 03EA 20 05 BRA LOOKGO
 03700 *FOUND A B, LOOK FOR GOSU
 03710 03EC C6 04 LGOSUB LDA B #4
 03720 03EE CE 0495 LDX #GOSUBS+4
 03730 03F1 FF 0489 LOOKGO STX SAVELX
 03740 03F4 FE 048C LDX SAVERX
 03750 03F7 09 SLOOP5 DEX
 03760 03F8 FF 048C STX SAVERX
 03770 03FB A6 00 LDA A 0,X
 03780 03FD 81 20 CMP A #520
 03800 0401 FE 0489 LDX SAVELX
 03810 0404 09 DEX
 03820 0405 FF 0489 STX SAVELX
 03830 0408 A1 00 CMP A 0,X
 03840 040A 26 C6 BNE FAIL
 03850 040C FE 048C LDX SAVERX
 03860 040F 5A DEC B
 03870 0410 26 E5 BNE SLOOP5
 03880 *DEFINITELY FOUND GOTO, GOSUB, OR THEN
 *PUT 05 AND NEW LINE NUMBER IN 'STRING'
 03890 0412 FE 01EC LDX SPOINI
 03900 0415 86 05 LDA A #505
 03920 0417 A7 00 STA A 0,X
 03930 0419 08 INX
 03940 041A FF 01EE STX SPOIN2
 03950 *SKIP ZEROES AT START
 03960 041D CE 02E9 LDX #LINENO
 03970 0420 A6 00 SLOOP6 LDA A 0,X
 03980 0422 81 30 CMP A #'0
 03990 0424 26 03 BNE SLOOP7
 04000 0426 08 INX
 04010 0427 20 F7 BRA SLOOP6
 04020 *GOT FIRST NONZERO DIGIT
 04030 0429 FF 0489 SLOOP7 STX SAVELX
 04040 042C A6 00 LDA A 0,X
 04050 042E FE 01EE LDX SPOIN2
 04060 0431 A7 00 STA A 0,X
 04070 0433 08 INX
 04080 0434 FF 01EE STX SPOIN2
 04090 0437 FE 0489 LDX SAVELX
 04100 0438 A8 04 INX
 04110 043B 8C 02ED CPX #LINENO+4
 04120 043E 26 E9 BNE SLOOP7
 *BOTH LINE NUMBERS IN 'STRING'
 04130 *FIND DIFFERENCE IN LENGTHS
 04140 *CALCULATE LENGTHS
 04150 0440 FE 01EE LDX SPOIN2
 04160 0443 4F CLR A
 04170 0444 BD 0267 JSR CALCDF
 04180 *GO TO DO SWITCH
 04190 0447 BD 0279 JSR SWITCH
 04200 *AFTER REPLACEMENT OF LINE NUMBERS,
 *UPDATE CURRENT POINTER IF STRINGS
 04210 *WERE DIFFERENT LENGTHS AND REFERENCE
 04220 *WAS BEFORE CURRENT LINE
 04230 044A F6 02E6 LDA B COMPARE
 04250 044D 26 03 BNE CHECK1
 04260 044F 7E 03D2 GOFAIL JMP FAIL
 *DIFFERENT LENGTHS: BEFORE?
 04280 0452 B6 02ED CHECK1 LDA A SAVESX
 04290 0455 B1 01BE CMP A SAVEX
 04300 0458 27 04 BEQ CHECK2
 04310 045A 2A 0A BPL UPDATE
 04320 045C 20 F1 BRA GOFAIL
 04330 045E B6 02EE CHECK2 LDA A SAVESX+1
 04340 0461 B1 01BF CMP A SAVEX+1
 04350 0464 28 E9 BMI GOFAIL
 *YES, SO UPDATE
 04370 0466 FE 02ED UPDATE LDX SAVESX
 04380 0459 5D TST B
 04390 046A 2A 09 BPL SUBPTR
 04400 046C 03 ADDPTR INX
 04410 046D 5C INC B
 04420 046E 26 FC BNE ADDPTR
 04430 0470 FF 02ED PTROK STX SAVESX
 04440 0473 20 DA BRA GOFAIL
 04450 0475 09 SUBPTR DEX
 04460 0476 5A DEC B
 04470 0477 26 FC BNE SUBPTR
 04480 0479 20 F5 BRA PTROK
 *WHEN DONE REMOVE ALL 05 CODES
 04500 047B 86 05 DONE LDA A #505
 04510 047D B7 01C4 STA A STRING
 04520 0480 CE 01C5 LDX #STRING+1
 04530 0483 FF 01EC STX SPOINI
 04540 0486 7E 024B JMP REPL2
 04550 0489 0002 SAVELX RMB 2
 04560 048A 0001 ZFLAG RMB 1
 04570 048C 0002 SAVERX RMB 2
 04580 048E 47 GOTSTR FCC 'GOT'
 04590 0491 47 GOSUBS FCC 'GOSU'
 0490 54
 0492 4F
 0493 53
 0494 55
 0495 54 THENST FCC 'THE'
 0496 48
 0497 45
 0498 0001 TEXT RMB 1
 0499 4F ORG SA048
 0460 049A 0100 FDB HARDST
 04640 END

Then the command R.GOTO. GO TO. inserts a space into all

```

> P
0001 INPUT A
0002 ON A GOTO 10,100
0007 GO TO 1
0010 IF A=A12 THEN 2000
0100 GOSUB 5000
5000 PRINT "SPOT"
5001 END

> R .GOTO.GO TO.
> R .SPOT.STOP.
> R .:,:.
> F .PRINT.
5000 PRINT "STOP"
> S

> P

0010 INPUT A
0020 ON A GO TO 40, 50
0030 GO TO 10
0040 IF A=A12 THEN 2000
0050 GOSUB 60
0060 PRINT "STOP"
0070 END

```

Fig. 1. Sample printout produced by BASEDIT.

GOTOS. The command R.SPOT .STOP changes the spelling of STOP. The command R.,. adds a space after every comma. A Find command finds all lines containing the word PRINT; the S command renumerates the lines; and finally, the P command prints out the result.

The BASLIST Program

BASLIST is not nearly as useful as BASEDIT, but it, too, is handy to have. BASLIST accepts as input a BASIC source program cassette, splits it up into 11-inch pages of 66 lines and numbers each page. It is also a machine-language program occupying locations 0100 through 01A1 in memory; the remaining memory from 01A2 and up is used for storing the BASIC program to be printed. Its hard-start address is 0100, and the restart address is 0103.

When BASLIST is started at

0100, it immediately goes into its read mode. A program can then be read in from cassette tape and stored into memory by BASLIST. When the cassette is done, the paper in the printer should be positioned about four lines from the bottom of a page—assuming that perforated paper is used. (BASLIST assumes that the printer is a teleprinter or other serial printer; it is not designed to work with the SWTP printer.)

Once the paper is properly positioned, start the printout by typing a Ctrl-E (hex 05) code on the keyboard. The program then does eight line feeds and starts printing. When printing is over, BASLIST goes into a loop and halts. It can be interrupted by pressing the reset button; the printout can be restarted from the beginning at any time by starting at 0103.

Many BASIC tapes from the

SWTP 8K BASIC system are preceded by the word SAVE and followed by an extra READY. BASLIST removes these from the printout and provides a neat listing of only the program itself. (This is handy for preparing BASIC programs for submission to *Kilobaud*.)

Each page of the printed output is preceded by the words PAGE NO. and a page number starting at 1. The text for this line is stored at locations 0124 through 0136 of the program (see line 00270 of the BASLIST source listing). But the words PAGE NO. are preceded by ten spaces in locations 0124 through 012D. Or, if desired, these ten spaces could be replaced by the ASCII codes for up to nine characters of a program name prior to running (using the M command of the monitor); the program name will then also print on every page. ■

```

00010          NAM    BASLIST
00020          *PROGRAM TO PAGINATE BASIC LISTINGS
00030          OPT    0
00040          *MONITOR ENTRY POINTS
00050          E1AC  INEEE EQU  $E1AC
00060          E1D1  OUTEEE EQU  $E1D1
00070          E07E  PDATA  EQU  $E07E
00080          E0BF  OUTBYT EQU  $E0BF
00090 0100    ORG    $0100
00100          *HARD AND SOFT STARTS
00110 0100 7E 0106 HARST JMP  START
00120 0103 7E 013E SOFTST JMP  LIST
00130 0106-CE 0103 START LDX  #$0103
00140 0109 FF 0A48 STX  $A048
00150 010C 8E 0A42 LDS  #$A042
00160 010F CE 01A2 LDX  #TEXT
00170 0112 BD E1AC LOOP JSR  INEEE
00180 0115 A7 00 STA  A 0,X
00190 0117 81 05 CMP  A  #$05
00200          *EXIT ON CONTROL E
00210 0119 27 23 BEQ  LIST
00220 011B 08 INX
00230 011C FF 0121 STX  LAST
00240 011F 20 F1 BRA  LOOP
00250 0121 0002 LAST RMB  2
00260 0123 0001 PAGENO RMB  1
00270 0124 20 PAGE  FCC          PAGE NO.
0125 20
0126 20
0127 20
0128 20
0129 20
012A 20
012B 20
012C 20
012D 20
012E 50
012F 41
0130 47
0131 45
0132 20
0133 4E
0134 4F
0135 2E
0136 20
00280 0137 04 FCB  $04
00290 0138 0D CRLFLF FCB  $D,$A,$A,$4
0139 0A
013A 0A
013B 04
00300 013C 0002 XTEMP RMB  2
00310 013E CE 01A2 LIST LDX  #TEXT
00320 0141 8E A042 LDS  #$A042

```

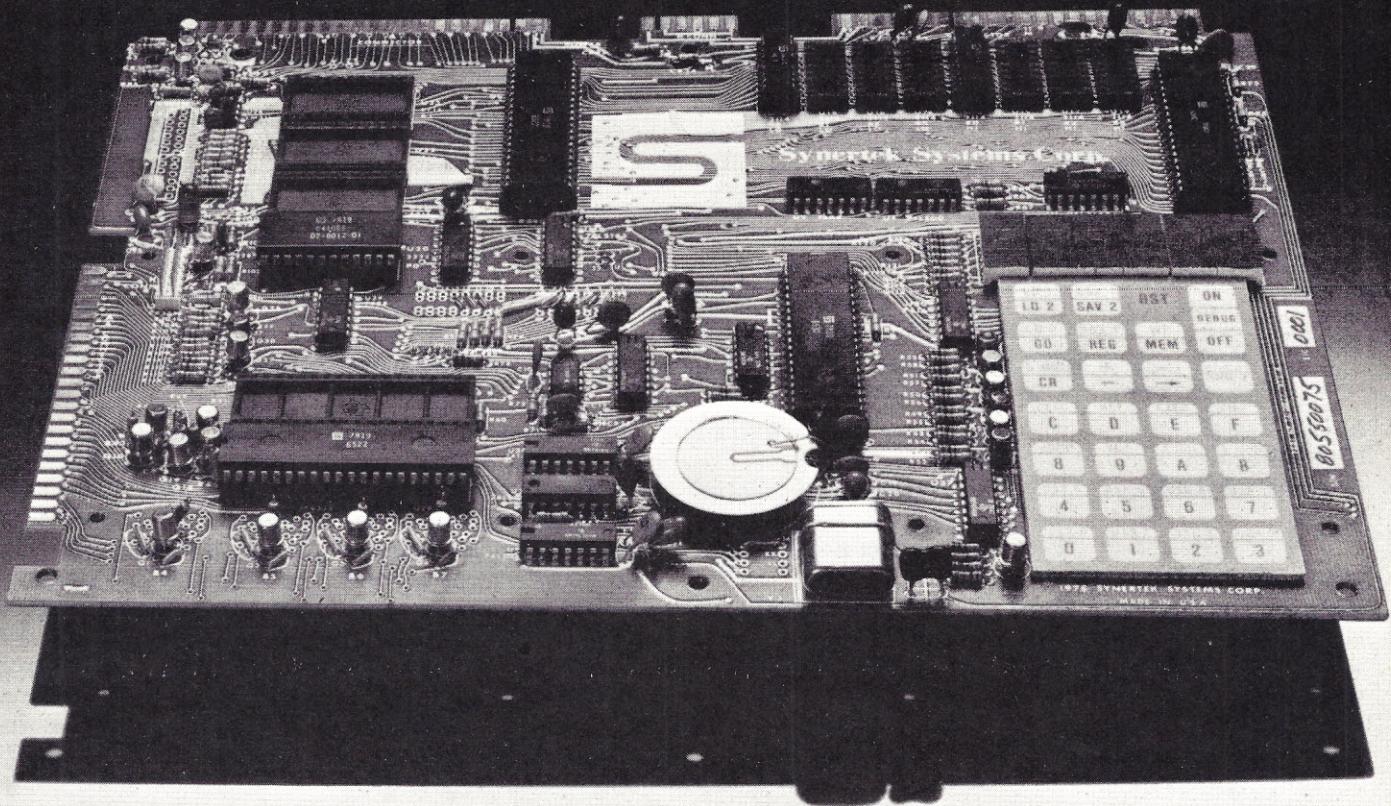
```

00330          *SKIP TO FIRST SIX 02
00340 0144 A6 00 LOOK  LDA A 0,X
00350 0146 81 02 CMP  A #$02
00360 0148 27 03 BEQ  GO
00370 014A 08 INX
00380 014B 20 F7 BRA  LOOK
00390          *READY TO PRINT
00400 014D 7F 0123 GO  CLR  PAGENO
00410 0150 86 0D LDA A #$0D
00420 0152 BD E1D1 JSR  OUTEEE
00430          *SKIP 8 LINES
00440 0155 C6 08 NEWPAG LDA B #8
00450 0157 86 0A SKIP8 LDA A #$0A
00460 0159 BD E1D1 JSR  OUTEEE
00470 015C 5A DEC  B
00480 015D 26 F8 BNE  SKIP8
00490          *PRINT NAME AND PAGE
00500 015F FF 013C STX  XTEMP
00510 0162 CE 0124 LDX  #PAGE
00520 0165 BD E07E JSR  PDATA
00530          *INCREMENT AND PRINT PAGE NO
00540 0168 BS 0123 LDA A PAGENO
00550 016B 88 01 ADD A #$01
00560 016D 19 DAA
00570 016E B7 0123 STA A PAGENO
00580 0171 CE 0123 LDX  #PAGENO
00590 0174 BD E0BF JSR  OUTBYT
00600          *PRINT CR AND 2 LF
00610 0177 CE 0138 LDX  #CRLFLF
00620 017A BD E07E JSR  PDATA
00630 017D FE 013C LDX  XTEMP
00640 0180 C6 38 LDA B #56
00650          *DO NEW LINE
00660 0182 A6 00 NEWLIN LDA A 0,X
00670 0184 81 0A CMP  A #$0A
00680 0186 27 0F BEQ  ENDLIN
00690 0188 81 03 CMP  A #$03
00700 018A 27 14 BEQ  STOP
00710 018C BD E1D1 JSR  OUTEEE
00720 018F 08 INX
00730 0190 BC 0121 CPX  LAST
00740 0193 27 0B BEQ  STOP
00750 0195 20 EB BRA  NEWLIN
00760 0197 BD E1D1 ENDLIN JSR  OUTEEE
00770 019A 08 INX
00780 019B 5A DEC  B
00790 019C 27 B7 BEQ  NEWPAG
00800 019E 20 E2 BRA  NEWLIN
00810 01A0 20 FE STOP BRA  STOP
00820 01A2 0001 TEXT RMB  1
00830 A043 ORG  $A048
00840 A048 0100 PC  FDB  HARDST
00850

```

Program 2. BASLIST program.

SYM-1. Finally, a dependable microcomputer board.



In performance. In quality. In availability. OEMs, educators, engineers, hobbyists, students, industrial users: Our Versatile Interface Module, SYM-1, is a fully-assembled, tested and warranted microcomputer board that's a true single-board computer, complete with keyboard and display. All you do is provide a +5V power supply and SYM-1 gives you the rest—and that includes fast delivery and superior quality.

Key features include:

- Hardware compatibility with KIM-1 (MOS Technology) products.
- Standard interfaces include audio cassette with remote control; both 8 bytes/second (KIM) and 185 bytes/second (SYM-1) cassette formats; TTY and RS232; system expansion bus; TV/KB expansion board interface; four I/O buffers; and an oscilloscope single-line display.

- 28 double-function keypad with audio response.
- 4K byte ROM resident SUPERMON monitor including over 30 standard monitor functions and user expandable.
- Three ROM/EPROM expansion sockets for up to 24K bytes total program size.
- 1K bytes 2114 static RAM, expandable to 4K bytes on-board and more off-board.
- 50 I/O lines expandable to 70.
- Single +5V power requirements.
- Priced attractively in single unit quantities; available without keyboard/display, with OEM discounts for larger quantities.

Synertek Systems Corporation.

150-160 S. Wolfe Road, Sunnyvale, California 94086
(408) 988-5690.

To place your order now, contact your local area distributor or dealer.

OEM Distributors

Kierulff Electronics
Sterling Electronics (Seattle only)
Zeus Components
Century/Bell
Lionex
Hallmark
Intermark Electronics
Quality Components

Technico
General Radio
Western Microtechnology
Future Electronics
Alliance Electronics
Arrow Electronics

Personal Computer Dealers
Newman Computer Exchange
Ann Arbor, Michigan

Technico
Columbia, Maryland
Computerland
Mayfield Heights, Ohio
RNB Enterprises
King of Prussia, Pennsylvania
Computer Shop
Cambridge, Massachusetts
Computer Cash
Anchorage, Alaska

Anrona
Culver City, California
General Radio
Camden, New Jersey
Advanced Computer Products
Santa Ana, California
Computer Components
Van Nuys, California
Alltronics
San Jose, California

u-Panel

KIM users who don't have X-ray vision will find the following article useful.

George E. Lang
204 Sweetbriar St.
Pittsburgh PA 15211

Can you see the reaction of every register in your microprocessor as you are single-stepping through the program? If so, skip this article; if not, read on.

On my KIM-1 microprocessor, all the registers are internal to the chip and are not directly visible. This is a problem common to most other chips and systems as well. There is a means for "looking at" all registers in single-step mode, but after many hours of doing this, I decided to let "constructive laziness" take over and to make a front panel showing all regis-

ters. This display I call the *u-Panel*.

My criteria for the panel are as follows.

1. No object program modification.
2. Cost (as inexpensive as possible).
3. No physical modifications to KIM.
4. Simple to load.
5. Easy to connect.
6. Looks like a front panel.

KIM Single-Step Operation

In the KIM monitor SST (single-step) mode, the monitor is displaying the current address and the current contents (data or instruction). When the GO button is pressed, the monitor is exited, the instruction is executed and, at the same time as execution, the NMI (non-maskable interrupt) line is pulled low thus enabling the interrupt. The interrupt is not executed, however, until the instruction currently in the processor is finished.

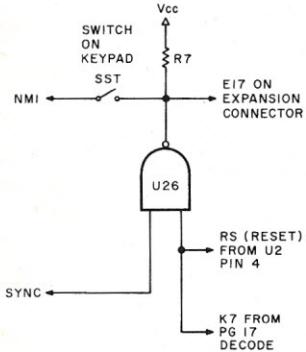


Fig. 1. Within the KIM, a signal is generated at the output of U26 with each instruction execution, and is made available at pin 17 of the expansion connector.

When the instruction "execute" cycle is done, the KIM looks at the NMI vector stored at 17FA-17FB (hex), the contents of which are normally 1C00 (hex), and loads these contents into the program counter. The interrupt is now serviced. During all this action, the program counter and stack pointer are pushed onto the stack.

When the interrupt program is executed, the stored registers are first pulled from the stack and stored in zero page locations, along with the accumulator and the X and Y index registers. These locations are the ones "looked at" during KIM SST operations. The monitor program, which was entered through the interrupt, then takes over the job of displaying the data and address, scanning the keys, etc. When the GO key is pressed again, an RTI (return from interrupt) is executed, and exit from monitor occurs; the whole process begins again.

Looking at the schematic shown in Fig. 1, I saw that a signal is generated on the output of U26 every time an instruction is executed. This signal combines the SYNC signal and an enable from the ROM chip and is fed into an N-O (normally open) switch (the SST). It also runs to E17 on the expansion edge connector. That signal is then used to trigger (with the SST switch closed) the NMI

response previously described.

I decided to use the IRQ (interrupt request), which has a vector at 17FE-17FF (hex), and an external N-O switch was connected between E4 (IRQ input) and E17 (output of U26) on the expansion connector. With the switch open, the program runs normally without interruption. With the switch closed, and upon an "execute" by the microprocessor (the GO button being pressed), the IRQ vector is loaded. Therefore, I can place my SST routine starting address into the IRQ vector and will execute the routine every time an IRQ is generated.

The program to enable the SST and output the registers resides on page 1 (0100-01FF hex). There are two reasons for this:

1. The stack sits on page 1, and I prefer that if anything is going to get overwritten due to stack overflow it be the short SST and not the long object program.

2. Page 0 is used for data. That's why there is zero page addressing.

There are two pages left—page 2 (0200-02FF hex) and page 3 (0300-03FF hex). If the user's program is to use continuous memory, the only place left for user program is starting on page 2.

Now, since I want to dump all of the registers to an external device before returning back to

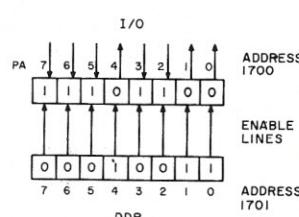


Fig. 2. The data direction register and I/O register shown being set up for saving all the KIM registers.

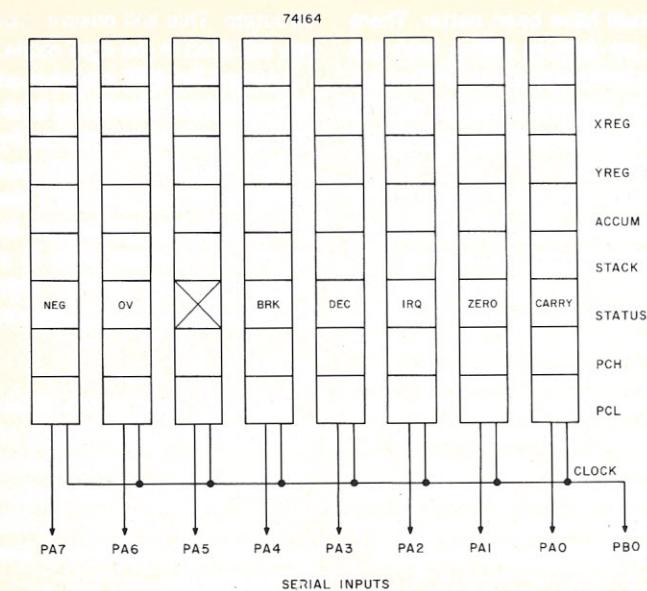


Fig. 3. KIM registers.

the monitor, I can't use the NMI interrupt. This is one of the reasons I selected the IRQ interrupt. Also, now that the IRQ is being used, the routine in ROM that saves all the registers and inserts them in zero page locations is missing. Therefore, this must be the first part of the new SST routine.

The I/O (input-output) ports on the KIM must be preselected by first setting the appropriate DDR (data direction register) bits. The DDR's bits are in direct correspondence to the I/O register bits. That is, if you wanted the least significant bit of the I/O port to be an input and the rest of the seven bits to be outputs, the word 01 (hex) 0000 0001 (binary) would be in-

serted into the DDR. If I wanted an 8-bit output, the DDR would be set to FF (hex) 1111 1111 (binary). In Fig. 2 the DDR has been loaded with 13 (hex) 0001 0011 (binary). Note how the I/O register is set.

Looking now at Fig. 3, you will see that the registers to be output are as follows:

1. Accumulator
2. X index register
3. Y index register
4. Status register
5. Stack pointer
6. PC high (most significant bits of the program counter)
7. PC low (least significant bits of the program counter)

These registers are found in the storage locations down on page 0. They are consecutively

loaded from 00EF-00F5 (hex) in this sequence:

- 00EF PC lo
- 00F0 PC hi
- 00F1 Status
- 00F2 Stack
- 00F3 Accumulator
- 00F4 Y index
- 00F5 X index

The Software

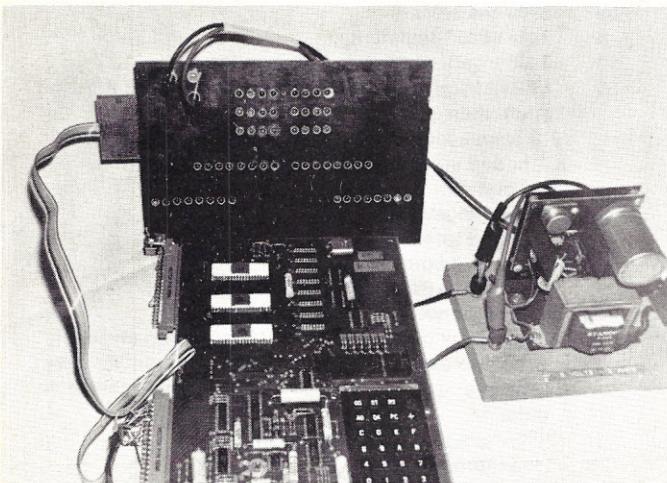
Turning now to the SST program listing, you can see the first part is the packing segment to place all register information into zero page memory locations 00FE-00F5 (hex). The next three parts are for setting the DDRs of the two I/O ports and for pulling PB0 low. The next part is to take the information (data) sequentially from the zero page locations, place the data on the I/O pins and pull PB0 high to shift the shift registers up one place.

Next comes a check to see if all locations have been loaded. If not, go back, increment to the next location, output to the 74164s, toggle PB0 and repeat until all seven levels are full.

When all of the levels have been filled, exit from the SST program and enter the KIM ROM monitor at location 1C4F (hex), which is called BEGIN.

With all shift registers filled with KIM register data, and the KIM monitor in a loop awaiting another GO command, you can now observe all of the registers on the front of the *u-Panel*. This information will stay until pushed out by your pressing the GO button and executing another instruction.

The front layout of the *u-Panel* is shown in the photo. It can be modified to suit. I have placed an edge connector and three female banana jacks to interface with the KIM merely because I had them around. A single larger edge connector



Completed front panel connected to, and working with, KIM.

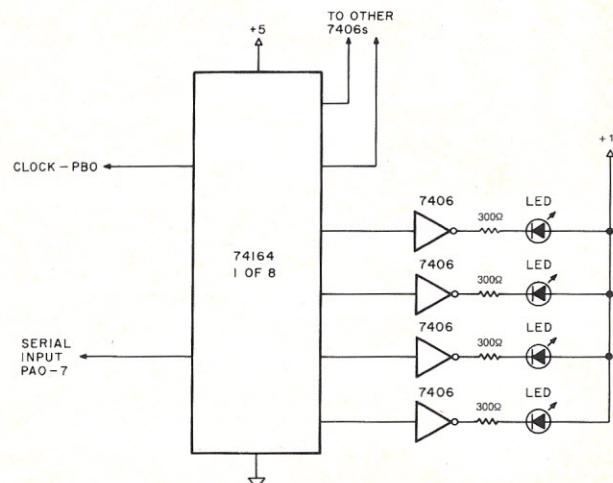


Fig. 4. Front panel LED interface circuit.

0130	STA	85	
0131	F3		
32	PLA	68	
33	STA	85	
34	F1		
35	PLA	68	
36	STA	85	
37	EF		Loads 00EF-00F5
38	STA	85	on IRQ escape.
39	FA		
3A	PLA	68	
3B	STA	85	
3C	F0		
3D	STA	85	
3E	FB		
3F	STY	84	
40	F4		
41	STX	86	
42	F5		
43	TSX	BA	
44	STX	86	
45	F2		
46	LDA	A9	
47	#01		Sets PB0 to output
48	STA	8D	
49	03		
4A	17		
4B	LDA	A9	
4C	#00		
4D	STA	8D	Stores 0 in PB0
4E	02		
4F	17		
50	LDA	A9	
51	#FF		Sets PA0-PA7 as output
52	STA	8D	
53	01		
54	17		
55	LDX	A2	# of locations to output
56	#07		
57	LDA	B5	Start at F5
58	EE		
59	STA	8D	Output F5
5A	00		
5B	17		
015C	LDA	A9	Set PB0 high
5D	#01		
5E	STA	8D	Load PA0-PA7 into shift register
5F	02		
60	17		
61	NOP	EA	
62	NOP	EA	Settling time
63	NOP	EA	
64	LDA	A9	
65	#00		
66	STA	8D	Set PB0 low
67	02		
68	17		
69	NOP	EA	
6A	NOP	EA	Settling time
6B	NOP	EA	
6C	DEX	CA	
6D	BNE	DO	Set X to (last reg.) - 1
6E	E8		If X not 0, go back and
6F	JMP	4C	output register.
70	4F		If X zero, jump to 'START'
71	1C		in KIM ROM listings.
NMI = 17FA - 17FB = 1C00			
RST = 17FC - 17FD = 1C00 VECTORS			
IRQ = 17FE - 17FF = 0130			
Note: All programs must have CLI (clear interrupt) in program initialization.			
EXPANSION CONNECTOR			
E4 E17			
SINGLE STEP SWITCH			

Program listing.

would have been better. There is no critical wiring with the possible exception of the current requirements for the 56 LEDs. You must use adequately-sized wire.

The ICs were cemented directly to the phenolic board, and wire-wrap sockets were inserted. I like wire wrap because there is no possibility of heat burnout of chips, and (for me) it is faster than soldering. If you do not want to use wire wrap, careful soldering will do as well. The LEDs were also cemented to the board. The whole building and testing procedure took about six hours.

Operation

Once the whole thing is built and tested, load the SST program starting at 0130 (hex) and put the user program anywhere there is spare memory. Again 0200 (hex) is recommended. The actual location is not important as far as the SST routines are concerned. To test a program under SST, place the added SST switch ON (closed), set the IRQ vector 17FE-17FF (hex) to 0130 (hex) instead of 1C00 (hex) and load your program.

Whenever the GO key on the KIM is pressed, all registers will be seen on the *u-Panel*, and the next instruction and address will be seen on the KIM LED displays. Leave the KIM SST switch OFF as it will not be needed. One last item—at the beginning of your program, place a CLI (clear interrupt) in-

struction. This will ensure that you will start in the right mode.

I placed the SST program on cassette tape to facilitate loading and reduce loading time. By loading the SST on tape and "plugging in" the *u-Panel*, I can be debugging programs in about two minutes. This is a reasonable time savings over hand-loading the SST program.

Summary

Now look back to my objectives stated at the beginning of this article. Did I achieve them?

1. No program modification ... I think 99 percent on this one. The only addition is the CLI instruction.

2. Cost ... with a little scrounging, you can duplicate this unit for \$25 or less. (A complete parts list is shown in Table 1.)

3. No physical modifications ... 100 percent on this one.

4. Simple to load ... with only 64 program steps and the availability of cassette, it is simple.

5. Ease of connection ... one edge connector and two power supply connections (both of which are on the KIM anyway).

6. Looks like a front panel ... I think it does!

I have built the *u-Panel* to be used by students in a classroom-laboratory situation for instructional purposes. I feel that you, as well as my students and I, will benefit by seeing all registers at once. I hope you get as much out of *u-Panel* as I have. ■

- 56 300Ω resistors
- 8 74164 Shift registers
- 10 7406 Inverting drivers—open collector
- 56 LEDs. If you wish to have different colors for the registers then order:
 - 8 each accumulator, X and Y registers, stack pointer and status register. (different colors)
 - Total 40
- 16 for program counter
- Grand total 56
- 18 Sockets, 14-pin DIP
- 1 Phenolic or Bakelite board for front panel
- 1 15-pin connector to interface with KIM
- 2 44-pin edge connectors for KIM expansion and application connectors. Do this only if you want to have separate connectors for the *u-Panel*, otherwise order 1.
- 1 SPST (single pole-single throw) switch
- Hookup wire
- Glue

Table 1. Parts list.

Introducing the simple TRS-80 Up-grade

**Fast, easy, guaranteed
expansion to 16K
at less than half the
price of Radio Shack.**

Ithaca Audio makes it simple

No false starts and finding you need some little item or special tool. Our Kit contains all the parts: 8 prime dynamic RAMs and a complete set of preprogrammed jumpers. No matter which model you have (even if you later purchase Level II software), you're covered.

Complete Instructions

Our easy-to-follow directions cut installation time to just minutes. You can do it yourself—with no soldering! All you need is a household screwdriver.

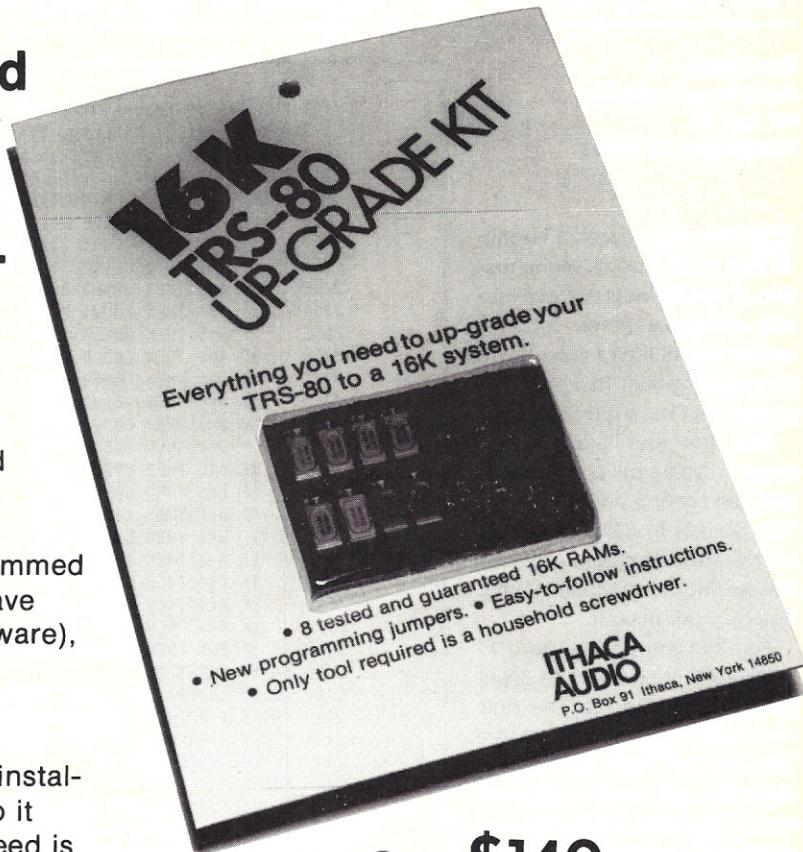
100% Guarantee

Like our kit, simple: if a part ever fails, we replace it, FREE.

Available now

Order from your favorite retailer. If by chance he hasn't stocked them yet we'll ship him your Kit right away.

Available off-the-shelf at these fine computer dealers.



Only \$140

For technical assistance call or write to:

**ITHACA
AUDIO**

Phone: 607/273-3271

P.O. Box 91 Ithaca, New York 14850

© 1978 Ithaca Audio

AL: BIRMINGHAM: Computer Center, (205) 942-8567. HUNTSVILLE: Computerland, (205) 539-1200. **CA:** BERKELEY: Byte Shop, (415) 845-6366. **EL CERRITO:** Computerland, (415) 233-5010. **HAYWARD:** Computerland, (415) 538-8080. **LOS ALTOS:** Computerland, (415) 941-8154. **MARINA DEL REY:** Base 2, (213) 822-4499. **MT. VIEW:** Digital Deli, (415) 961-2670. **SAN FRANCISCO:** Computerland, (415) 536-1592. **SAN JOSE:** Electronic Systems, (408) 226-4064. **SAN RAFAEL:** Computer Demo Room Inc., (415) 457-9311. **WALNUT CREEK:** Computerland, (415) 935-6502. **DE:** NEWARK: Computerland, (303) 738-9656. **FL:** FT. LAUDERDALE: Computer Age, (305) 791-8080. **POMPANO BEACH:** Computer Age, (305) 496-4999. **TAMPA:** Micro-computer Systems, (813) 879-4301. **IL:** NILES: Computerland, (312) 967-1714. **OAK LAWN:** Computerland, (312) 422-8080. **PEORIA:** Computerland, (309) 688-6252. **KS:** OVERLAND PARK: Personal Computer Center, (913) 649-5942. **WICHITA:** Computer Systems Design, (316) 265-1120. **KY:** LOUISVILLE: Computerland, (502) 425-8308. **MA:** CAMBRIDGE: Computer Shop, (617) 661-2670. **MD:** ROCKVILLE: Computerland, (301) 948-7676. **MI:** ANN ARBOR: Newman Computer Exchange, (313) 994-3200. **ROYAL OAK:** Computer Mart, (313) 576-0900. **NJ:** ANDOVER: Atlantic Microsystems, (201) 549-0189. **BUDD LAKE:** Computer Lab of New Jersey, (201) 691-1984. **CLARK:** S-100, (201) 382-1318. **ISELIN:** Computer Mart, (201) 283-0600. **SUCCASUNNA:** Computer Hut, (201) 584-4977. **NY:** BUFFALO: Computerland, (716) 836-6511. **ITHACA:** Computerland of Ithaca, (607) 277-4888. **JOHNSON CITY:** Micro World, (607) 798-9800. **NEW YORK CITY:** Computer Mart of New York, (212) 686-7923. **SYRACUSE:** Computer Shop of Syracuse Inc., (315) 446-1284. **OH:** CINCINNATI: Digital Design, (513) 561-6733. **DAYTON:** Computer Solutions, (513) 223-2348. **OK:** OKLAHOMA CITY: Micronics, (405) 942-8152. **PA:** FRAZER: Personal Computer Corp., (215) 647-8463. **STATE COLLEGE:** Microcomputer Products Inc., (814) 238-7711. **TN:** KNOXVILLE: Eastern Microcomputer, (615) 584-8365. **TX:** AUSTIN: Computerland, (512) 452-5701. **DALLAS:** KA Electronic Sales, (214) 634-7870. **GARLAND:** Digital Research Corp., (214) 271-2461. **HOUSTON:** Houston Computer Mart, (713) 649-4188. **UT:** OREM: Johnson Computer Electronics, (801) 224-5361. **VA:** ALEXANDRIA: Computers Plus, (703) 751-5656. **ARLINGTON:** Arlington Electronics Wholesalers, (703) 524-2412. **VT:** ESSEX JUNCTION: Computer Mart of Vermont, (802) 879-1683. **CANADA:** ONTARIO: MISSISSAUGA: Arisia Microsystems, (416) 274-6033. **TORONTO:** Computer Mart Ltd., (416) 484-9708. **WINNIPEG:** Patrick Computer Systems Inc., (204) 774-1655. **WEST GERMANY:** MUNICH: ABC Computer Shop, Schellingstrasse 33, 8000 Munchen 40 Microcomputer Shop, Toelzerstr, 8, D-815 Holzkirchen. **ISRAEL:** HAIFA: Microcomputer Eng Ltd., Haifa 31-070.

Rolling Dice

This rolling routine can be used in any game in which you caress the old cubes.

*Rod Hallen
Road Runner Ranch
PO Box 73
Tombstone AZ 85638*

Rolling Dice was not intended to be a stand-alone routine. It can be incorporated into any computer game that requires the rolling of dice. It will give some visual feel to many games that have only listings.

The first four lines of Program A enhance and identify and can be dropped if desired. The CLEAR in 2040 keeps my stacks from expanding out of bounds from too many reruns. You may not need it.

The first run through the "I" FOR-NEXT loop (2040 to 2090) generates and draws the first die, and X will equal its value. The second loop builds the other die, and X will equal both dice. X can now be used in the game that you attached "Rolling Dice" to.

2110 to 2112 are part of my file routine, and here you can jump or GOSUB to the program that uses these dice. I used $(1*1*1*1+9)$ in 2121 to 2126 instead of $(115+9)$ because I have never been able to get my BASIC to square, cube, etc., a number. This program is written in Processor Technology's BASIC 5 and should fit just about any version of BASIC.

If your BASIC interpreter al-

```
2051 ON D GOSUB 2122,2123,2123,2124,2124,2124  
2061 ON D GOSUB 2125,2122,2125,2122,2125,2124  
2071 ON D GOSUB 2122,2126,2126,2124,2124,2124
```

Program B. If your BASIC allows the above statement, these three lines can be substituted for lines 2051 to 2076 in Program A for a savings of 15 lines.

Program A. The Rolling Dice routine in BASIC can be incorporated into any game that requires the roll of the dice.

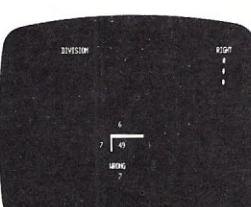
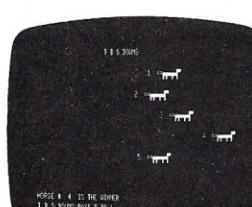
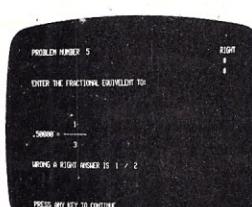
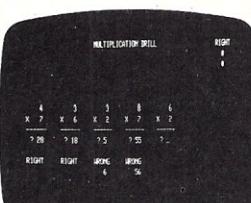
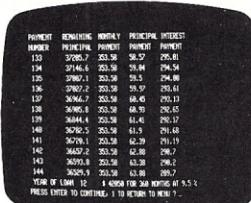
lows the "ON ... GOSUB ..." statement, lines 2051 to 2076 can be replaced with Program B. This will save you 15 statements. Good luck with the dice! ■

TYPE 1 FOR DICE, 2 FOR INDEX, AND 3 FOR BASIC. ?

Fig. 1. The printed lines at the beginning and end are part of my file index system and can be left out.

Level II TRS-80 + The LIBRARY 100

You shouldn't have one without the other!!



Finance: Present Value of a Future Sum—Simple Interest for Days—Future Value of a Present Sum—Amortization Schedule—Interest Rate: Compound Interest—Interest Rate: Installment Loan—Days Between Dates—Term of an Installment Loan—Present Value of a Series of Payments—Real Estate Capital Investment—Nominal and Effective Interest Rates—Internal Rate of Return—Future Value of Regular Deposits—Regular Deposits for Future Value—Depreciation Amount: Rate; Salvage Value; Schedule—Bond Present Value—Bond Yield to Maturity—Sale—Cost—Margin—Day of the Week—Moving Ad.

Education: Multiplication & Division—Add—Subtract—Fraction & Decimal—States & Capitals—States & Order of Entry—States & Abbreviation—Inventors & Inventions—World Capitals & Countries—Urban Areas & Population—Authors & Books—Presidents & Order—States & Largest City—Basenum.

Graphics: Left Right—Random Ad—Graphic—Blocks—Fireside—Snow—Step Ad 2—Launch—Ratrace—War Game—Weird—Herring—Blinker—Snoopy.

Home: Message Board—Expense Account—Nutrition—Mileage—Remember—Phone Codes—Night Check Off—Drunkometer—Perpetual Calendar—Babysitter—Calculator—Bartender—Christmas List—Vacation Check Off—Conversion.

Games: Speedy—Odd One—R. Roulette—Star Blazer—Search—Spyship—Tiger Shark—Jumble 2—Sting Ray—Stars—Sketch—Flipper—Scissors—Horse—Doomsday—Craps—Jumble 1—Mem. Quiz Letters—Mem. Quiz Numbers—Wheel of Fortune—Decision—Unjumble—Fifteen—Towers—Life—Star Trek—Race Track—Count—Roachrace—Gypsy.

The Library 100 is the best buy in software history! We do have one problem, though. Some people cannot believe that we can give you so much for only \$49.50. We suggest that if you don't believe it, you ask your friends who have purchased this software package or go to your local computer store and ask to see it.

The Library 100 is a collection of 100 original, quality programs, plus a new, easy programming language for your TRS-80, Tiny PILOT (TPILOT).

It took us 37 pages in our manual just to say a little about each program, so we cannot describe them all here. We did list them. How many can you use?

You've read the announcements in Kilobaud and Creative Computing. It is here and it is real. A value in excess of \$500.00 for only \$49.50 plus \$2.00 postage and handling (plus 4% for Georgia residents).

Watch for future software announcements. Hardware? Calculator? Business systems? Write and tell us what you want next.

Mail: \$49.50 + \$2.00 P & H + 4% if shipped to Georgia.

Call: 24-hour order service (404) 939-6031.
See: Your local computer store.



The Bottom Shelf, Inc.
P.O. Box 49104
Atlanta, Georgia 30359

✓ B44

Pseudo Graphics: An Inexpensive Approach

If the price of full-blown graphics has you down, then arise for long enough to check out this no-cost method. And while you're at it, chalk up your cue stick.

Margarine, Dacron, wigs—your life is probably full of substitutes for the real thing. So, why not for your computer system, too? Here comes pseudo-graphics.

Now *pseudo* doesn't mean *half-baked*. Both pseudo and full-baked graphics work on the same basic principle. Conceptually, the screen of a CRT (TV-type terminal) is divided into several small rectangles. Video effects are accomplished by turning various combinations of them on and off. Many interesting possibilities, both practical and recreational, can be achieved.

Any computer graphics requires a blend of hardware and software in order to operate. To add graphics to a computer system, a new hardware board is normally required. Also, additional software is usually necessary to drive it. Ideally, any graphics has high resolution, fast hardware and software execution times, color, versatility and low price.

Something for Nothing?

Now, get ready. We are introducing graphics for your system with low resolution, slow execution (but fast enough for certain video effects), black and white and little flexibility.

Hold it! Before you deluge the *Kilobaud* editors with threatening mail, consider this. The cost to implement this is

cheap—dirt cheap. If you have BASIC software and a CRT device with a few simple cursor control functions, you've already got all you need. Your system is capable of pseudo-graphics right now.

Even if you presently have a graphics capability, the game introduced in this article may prove interesting. It is a video game different than the usual computer fare. At least it may give you ideas for new ways to use your graphics.

Now, let's look at the basic idea of pseudo-graphics.

What It's All About

Consider your CRT screen completely divided into rectangular cells. Each of these cells is the size of one alphanumeric character on your screen. The cells are in a two-dimensional field filling the screen. The width of this field is the number of characters you can get in one line of display. The height of the field is the number of lines you can have on the screen at one time.

Now suppose your cursor appears in one of these cells. By issuing successive commands to move the cursor one rectangle orthogonally, we can generate a moving-ball effect similar to that achieved on video tennis and hockey games.

When this idea is packaged with the appropriate essentials and wrapped with some accom-

panying frills, bingo!—a new dimension to your computer system is realized. In order to utilize pseudo-graphics, your system must have a few simple capabilities. Let's look at them now.

The Bare Bones

First, a CRT-type output device is obviously necessary. Sorry, but if you have only a hard-copy terminal, we can't help you, Sundance (to paraphrase a famous actor). Go directly to the next article.

A controllable cursor is a necessity. Typical cursor char-

acters are a block rectangle (sometimes blinking) or an underscore character. Almost anything will do. If your keyboard has cursor control keys for cursor right, left, up and down, you have 90 percent capability. If not, take heart. Many terminals without these keys still have the basic internal hardware capability to accomplish these functions. See the section later on tuning the program. If your system has no cursor character (or an inadequate one), this problem can be overcome as explained later in the section on troubleshooting.

**The Hustler (there's that famous actor again)
vs Minnesota Fats (The Great One).**

3 CUSHION BILLIARDS

HOW MANY PLAYERS (1 OR 2)? 2
NAME OF PLAYER ONE? THE HUSTLER
NAME OF PLAYER TWO? MINNESOTA FATS
HOW MANY INNINGS FOR THE GAME? 7
TABLE LENGTH, TABLE HEIGHT? 36,14
CHARACTER RATIO (LENGTH TO HEIGHT)? .5
A RANDOM NUMBER PLEASE? 142857■

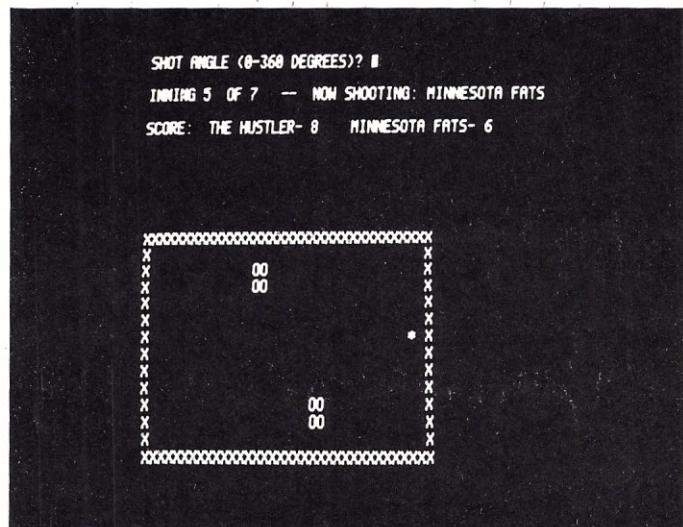
1. *The Hustler* challenges *Minnesota Fats* to a seven-inning game of three-cushion billiards. A large table size is set, presenting a challenging game to these championship-caliber rivals.

Either a home-down or home-up (preferably both) capability is needed. Also, the ability to erase the screen is nice, but can be achieved artificially.

Your BASIC software must have certain capabilities. The program presented here was written in Altair BASIC and its

with it. We have chosen to present a video game based on three-cushion billiards. For the benefit of those who have not misspent their youth around a pool hall, here is a simplified description of three-cushion billiards.

Regular billiards (as opposed



2. Fats faces a tricky fifth shot. The cue ball is near the right-hand cushion; the two object balls are spread wide apart. The Hustler is enjoying a two-point lead after his fifth shot. Fats is pondering what shot angle might give him a maximum three-pointer.

function names will be used as standard. The prime requirement is an OUT statement, or its equivalent, used to send a command to the CRT to print a certain character. This character may be alphanumeric or a cursor control command. The ASCII value of the desired character is contained in a variable that appears as part of the OUT statement.

Before each OUT statement, a WAIT statement is used to ensure any previous commands to the CRT have been completed. The WAIT statement is not a necessity, however. In fact, there are ways to overcome the lack of either of these statements. Again, see troubleshooting.

Still with us? Now let's introduce the game and discuss how to implement it on your system.

Three-Cushion Billiards

The pseudo-graphics technique is not very useful without something interesting to do

to pocket billiards, or pool) is played on a table having no pockets. Only three balls are used; one is a cue ball and the other two are object balls. The shooter strikes the cue ball and attempts to have it hit each object ball during the course of the shot.

Since this was too easy for many people, a new requirement was added to the game to achieve three-cushion billiards. The cue ball must strike and bounce off the perimeter cushions of the table at least three times before the second object ball is hit. The first ball can be hit after none, one, two or three cushions are struck.

We have modified the mechanics of the game. Upon his turn to shoot, a player is shown the location of the three balls on the CRT screen. The cue ball appears as an asterisk (*) character. The object balls are each a 2 x 2 square of O characters. The player is then asked at what angle (in degrees) he would like to shoot the cue ball.

(Zero degrees is horizontally to the right.)

The cursor then becomes positioned at the *. When the * disappears, the cursor, now representing the cue ball, begins to move at the angle input by the user. The cue ball reflects appropriately upon impact with a cushion. Striking an object ball is indicated by a plus (+) character where the cue ball contacts the object ball. The object balls don't move when hit. (Most game inventors would say this is to enable the shooter to predict the shot better. The truth is, however, that it is simply too cumbersome to implement.)

The shot ends when both object balls have been hit. If exactly three cushions have been hit, three points are awarded. If two or four cushions have been struck, two points are awarded. If one or five cushions have been hit, one point is given. No points are given if no cushions are struck. The shot also ends with no score if the cue ball strikes six cushions without having hit both object balls.

The game is primarily designed to be played by two contestants for an agreed number of innings (i.e., shots). It can also be used in a one-player or practice mode.

Tuning the Program

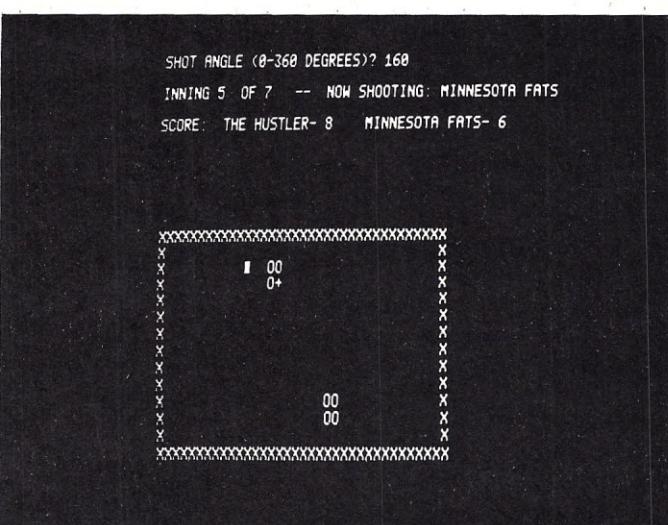
The program must be tuned

to your particular system. Basically, this is a simple process. It essentially involves setting the correct decimal ASCII constants in a few key lines of the program. The program was written in a modular subroutine fashion to facilitate access to the needed changes. All user required changes will appear from line 8000 to the end.

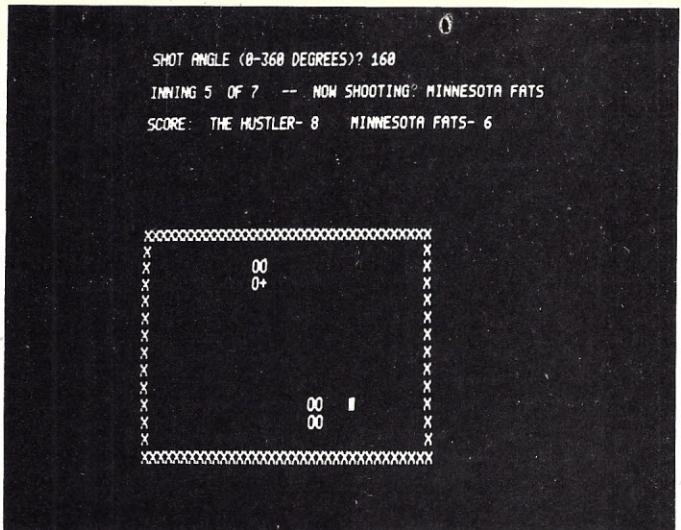
For those not familiar with the term ASCII, a brief description now follows. In order for different machines (and different parts of the same machine) to talk to each other, a correlation between bit patterns and graphic (and control) characters must be established.

One such correlation, called ASCII code, is used on most microcomputers. It assigns an alphanumeric, control or special character to each decimal number from 0 to 255. This covers all bit patterns achievable with eight bits. Some systems use seven-bit ASCII code that is defined only for the decimal numbers 0-127.

Unfortunately, there is very little standardization for what ASCII value should correspond to what cursor or screen control function among different CRT systems. The values for alphanumeric and special characters are fairly standard, however. The program listing, as presented, contains the values for a Datapoint 3300 terminal.



3. Having decided on an angle of 160 degrees, Fats watches his shot in progress. The cue ball has struck the upper object ball and is now heading toward the top cushion near the upper left-hand corner.



4. *Fats is starting to smile. The cue ball, having struck the upper, left and right cushions, is heading straight for the lower object ball.*

If you don't know which ASCII codes correspond to certain control functions on your system, some experimentation is in order. First, you might try running this loop:

```
10 FOR X=0 TO 255
20 FOR J=1 TO 1000:NEXT J
30 PRINT X,("";CHR$(X);")
40 PRINT
50 NEXT X
```

The function `CHR$(X)` returns the character, or control function, your system interprets for the ASCII value `X`.

This program will produce two columns of output. The left one will be simply the ASCII values from 0 to 255. The second column will contain a left and right parenthesis enclosing the character your system interprets for the ASCII value in the first column. A blank line is output after each "regular" line. The loop in line 20 merely slows down the output so you can more easily view what's happening.

The alphanumerics and special characters will be easy to detect. They will be plainly displayed between the two parentheses on the line with their corresponding ASCII value `X`.

The control functions are a little harder to determine, however. Home up will cause the output display to suddenly jump to the top of the screen. The clear function will result in the entire screen blanking out. Cursor up (cursor down) will cause the right parenthesis to

be up (down) from its corresponding left parenthesis. Cursor left will cause the left parenthesis to be immediately overwritten by the right parenthesis.

On most systems, the control functions correspond to the lower ASCII values. You should be able to detect most, if not all, of them by judiciously watching the output of this program. For some ASCII values, however, you might see that something happened but not be sure exactly what. This may require running a special test to isolate the function.

It may help to merely in-

crease the delay constant in line 20. The loop bounds in line 10 can be narrowed down to a small range around the suspected value. Perhaps an independent experiment would be useful.

For example, suppose the value of `X=25` causes the left parenthesis to be overwritten by the right one. As mentioned earlier, this would seem to indicate that the ASCII value 25 corresponded to a cursor left. However, some systems have a delete function that might cause the same result. To distinguish these, try this special test:

```
PRINT"XXXXX";CHR$(25);CHR$(25);"Y"
If Chr$(25) does a cursor left,
the output will be:
```

XXXY

If `CHR$(25)` does a delete, the output will be:

XXYY

One final note on this subject of determining ASCII constants. Many systems support the `ASC` function. This returns the needed ASCII arguments directly. For example, to find the ASCII argument for the special character `+`, the direct statement `PRINT ASC(" +")` will return it immediately. If your system has keys for the various control functions, try the same thing with the control key being used in place of the plus sign. Many of these may

work. This is the simplest way of all to determine the correct ASCII value of each character.

OK, for the time being we will assume you know which ASCII values correspond to which control and alphanumeric functions. What's more, for now we will assume your BASIC is Altair compatible in syntax. Incompatibilities are deferred to troubleshooting.

The Infamous Lines 8100-9070

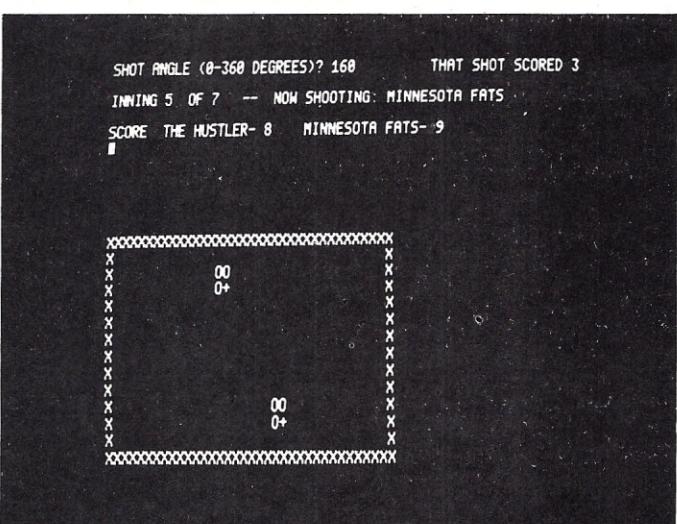
Now, let's look at lines 8100-9070. During this discussion, we will indicate where, and how, to make the necessary program changes. Later, in troubleshooting, we will discuss ways to overcome certain problems or lack of capabilities in your system.

Lines 8100-8320 contain the subroutines that send the cursor movements and character displays to the screen through the `OUT` statements. If one character is to be sent, its ASCII code has been stored in the variable `A` and a `GOSUB` will be made to line 8100. If two characters are to be sent, the variables `A` and `B` are used with `GOSUB` 8200. Similarly, three characters require variables `A`, `B`, and `C` and `GOSUB` 8300. No modifications are necessary here. The `WAIT` statements and the `OP` variable in the `OUT` statements will be discussed soon.

`GOSUB` 8400 is issued whenever a home up is required by the program. For our system, the decimal number 29 corresponds to a home up and is duly set in line 8410. If your home up is a different ASCII constant, make the appropriate change on line 8410. Similarly, home down is set at the beginning of line 8610. For our system, we used the number 28. Change this if yours is different.

Clearing the screen is done in the subroutines at 8800. In our system, 31 cleared the screen, but only from the current position of the cursor down. Thus, in our routine, a `GOSUB` 8400 (which does a home up, remember!) is executed before setting `A=31` and the `GOSUB` 8100.

The time-waster routine at



5. *Success! Both object balls have been hit and the cushion has been hit three times. The scoreboard duly reflects Fats' maximum three-pointer and indicates he has taken the lead. Has the Hustler bit off more than he can chew?*

LINE #	ROUTINE
400	MAIN PROGRAM
1000	INITIALIZE VARIABLES
1500	GAME SET-UP
2000	PROMPT NEXT PLAYER
2500	DRAW TABLE NX BY NY
3000	PICK BALL LOCATIONS
3500	DISPLAY BALLS
4000	GET SHOT ANGLE FROM PLAYER
4500	INITIALIZE SHOT
5000	MOVE CURSOR ONE TIME STEP
5500	CHECK FOR BALL COLLISIONS
6000	SHOT ENDS—SHOW SCORE
6500	CHECK FOR CUSHION HITS
7000	MOVE CURSOR TO LX , LY
7500	END GAME
8100	SEND ONE CHARACTER TO CRT
8200	SEND TWO CHARACTERS
8300	SEND THREE CHARACTERS
8400	DO HOME UP
8600	DO HOME DOWN
8800	CLEAR SCREEN
8900	TIME DELAY
9000	SET ASCII AND SYSTEM DEPENDENT VARIABLES

Fig. 1. Program routines by line number.

8900 is called by the main program to delay execution at a couple places. It is relatively unimportant and should require no modification.

At last we get to the nitty-gritty! In line 9040, the ASCII values for moving the cursor right, left, up and down are set to the variables R, L, U and D, respectively. The next line contains various characters and control functions. They are by variable name: X (the letter X), OH (the letter O), ST (the star or asterisk *), SP (a blank space), BL (the bell or beeper), N (no action or null), PL (the plus character +).

The only values that might need changing are N and BL; the rest are standard. N is simply no action. Several ASCII values will probably do this. If you have no device for sound on your terminal, set BL to the same value used for N. That would be too bad, however, because sound effects are incorporated in the program, just as in the big-time video stuff. *Kilobaud* is high class all the way.

On line 9060, the remaining arguments of the OUT and WAIT statements are set. The variable OP is your output port (i.e., CRT screen). IP is the input port or, more accurately, the control port. The terminology *input port* is used only because our Altair BASIC manual refers to it as such in its discussion of the WAIT statement. This reference is actually to the control

port that monitors the I/O status for data ready to be sent to the output port. If you don't know these port numbers for your system, refer to troubleshooting (hang on—we'll get there yet).

The WAIT statement is used

to ensure that the following OUT transmission will not be sent until the CRT has finished any previous request. The arguments W1 and W2 of the WAIT statement are set to the appropriate values to ensure that the control port has signaled "ready." Probably these will not need changing. Refer to your system documentation if necessary.

The Pre-game Warm-up

Finally! The necessary program modifications have been made. Your palms are sweaty with anticipation. Are we ready to run yet? Well yes, almost. There are a couple questions in the program's initialization dialogue that might floor you if we don't discuss them briefly.

When you type "RUN," the program will ask the names of the players and how many (1 or 2) are taking part. Next, it requests the number of innings (or shots) each player will have

in the game. No problem so far.

You are now asked to input the table length and height in units of characters. This controls the size of the billiards table, which adjusts the degree of difficulty of the game. The larger the table, the harder it is to score points. Each dimension should be at least eight. The length is limited only by the number of characters your screen holds in one line. The height should be no more than the number of lines on your screen minus six (to leave room for current game status information printed at the top of the screen).

The next question asks the user about the shape of one character cell. It requests the ratio of the length to the height of one cell. If this ratio were one, the cell would be a square. For most CRT displays, the actual value will not be one. This would cause a distortion in the cursor movement if not correct-

Program listing.

```

100 REM *****
110 REM *
120 REM *
130 REM *
140 REM * - 3 CUSHION BILLIARDS -
150 REM * *
160 REM * USING A PSEUDO-GRAFICS CURSOR CONTROL TECHNIQUE *
170 REM * *
180 REM * COPYRIGHT 1978 BY PHIL FELDMAN AND TOM RUGG *
190 REM * *****
200 REM *
210 REM *
220 REM *
230 REM *
240 REM *
250 REM *
260 REM *
270 REM *
280 REM *
290 REM *
300 REM *
310 REM *
320 REM *
330 REM *
340 REM *
350 REM *
360 REM *
370 REM *
380 REM *
390 REM *
400 GOSUB 1000:REM INITIALIZE REGULAR VARIABLES
410 GOSUB 9000:REM SET USER DEFINED VARIABLES
420 GOSUB 1500:REM SET UP GAME
430 P=P+1:IF P>NP THEN P=1:I=I+1
440 IF I>NI THEN 7500:REM END GAME
450 GOSUB 2000:REM PROMPT NEXT PLAYER
460 GOSUB 2500:REM DRAW TABLE
470 GOSUB 3000:REM PICK BALL LOCATIONS
480 GOSUB 3500:REM DRAW BALLS
490 GOSUB 4000:REM GET SHOT ANGLE FROM PLAYER
500 GOSUB 4500:REM INITIALIZE SHOT
510 GOSUB 5000:REM MOVE CURSOR ONE TIME STEP
520 GOSUB 5500:REM CHECK BALL COLLISIONS
530 IF NB>3 THEN GOSUB 6000:GOTO 500:REM SHOT OVER
540 GOSUB 6500:REM CHECK IF CUSHION HIT
550 IF CU>6 THEN GOSUB 6000:GOTO 500:REM SHOT OVER
560 GOTO 700
570 REM *****
580 INPUT"NAME OF PLAYER ONE";P$(1):INPUT"NAME OF PLAYER TWO";P$(2)
590 INPUT"How many innings for the game";NI
600 INPUT"Table length , table height";NX,NY
610 INPUT"Character ratio (length to height)";SR:IF SR<=0 THEN 650
620 INPUT"A random number please";K:K=RND(-ABS(K)):XR=NX-2
630 YU=NY-2:RETURN
640 REM *****
650 INPUT"Prompt next player"
660 GOSUB 8800:GOSUB 8400:PRINT"OK ";P$(P):PRINT:PRINT
670 PRINT"Chalk up your cue!":GOSUB 8900:GOSUB 8800
680 GOSUB 8400:PRINT:PRINT
690 PRINT"INNING";I;" OF";NI;" -- NOW SHOOTING: ";P$(P):PRINT

```

```

2050 PRINT"SCORE: ";P$(1);"-";S1:IF NP=2 THEN PRINT" ";P$(2);"-";S2
2060 RETURN
2500 REM ***** DRAW TABLE NX BY NY
2510 GOSUB 8600:A=X:FOR K=1 TO NX:GOSUB 8100:NEXT:A=L:B=U:C=X
2520 FOR K=1 TO NY-1:GOSUB 8300:NEXT:GOSUB 8600:A=U:B=X:C=L
2530 FOR K=1 TO NY-1:GOSUB 8300:NEXT:A=X:FOR K=1 TO NX-1:GOSUB 8100
2540 NEXT:RETURN
3000 REM ***** PICK BALL LOCATIONS
3010 X1=INT(RND(1)*(NX-3))+1:Y1=INT(RND(1)*(NY-3))+2
3020 X2=INT(RND(1)*(NX-3))+1:Y2=INT(RND(1)*(NY-3))+2
3030 K=ABS(X1-X2):Q=ABS(Y1-Y2):IF K<3 AND Q<3 THEN 3020
3040 XB=INT(RND(1)*(NX-4))+2:YB=INT(RND(1)*(NY-4))+2
3050 K=(X1-XB)↑2+(Y1-YB)↑2:IF K<4 THEN 3040
3060 K=(X2-XB)↑2+(Y2-YB)↑2:IF K<4 THEN 3040
3070 RETURN
3500 REM ***** DRAW BALLS
3510 LX=X1:LY=Y1:GOSUB 7000:A=OH:B=OH:GOSUB 8200
3520 A=L:B=L:C=D:GOSUB 8300:A=OH:B=OH:GOSUB 8200
3530 LX=X2:LY=Y2:GOSUB 7000:A=OH:B=OH:GOSUB 8200
3540 A=L:B=L:C=D:GOSUB 8300:A=OH:B=OH:GOSUB 8200
3550 LX=XB:LY=YB:GOSUB 7000:A=ST:GOSUB 8100:RETURN
4000 REM ***** GET ANGLE AND NORMALIZE IT
4010 GOSUB 8400:INPUT"SHOT ANGLE (0-360 DEGREES)";G:G=G*3.14159/180
4020 DX=COS(G):DY=SIN(G):IF SR>1 THEN DX=DX/SR
4030 IF SR<1 THEN DY=DY*SR
4040 IF ABS(DX)<0.5 AND ABS(DY)<0.5 THEN DX=DX*2:DY=DY*2:GOTO 4040
4050 RETURN
4500 REM ***** INITIALIZE SHOT
4510 LX=XB:LY=YB:GOSUB 7000:NB=0:CU=0:IX=XB:IY=YB:RX=XB+.49:RY=YB+.49
4520 GOSUB 8900:A=SP:B=L:GOSUB 8200:RETURN
5000 REM ***** MOVE CURSOR FOR ONE TIME STEP
5010 RX=RX+DX:RY=RY+DY:TX=INT(RX):TY=INT(RY)
5020 A=N:B=N:IF TX>IX THEN A=R:GOTO 5040
5030 IF TX<IX THEN A=L
5040 IF TY>IY THEN B=U:GOTO 5060
5050 IF TY<IY THEN B=D
5060 GOSUB 8200:IX=TX:IY=TY:RETURN
5500 REM ***** CHECK AND PROCESS BALL COLLISIONS
5510 IF NB>1 THEN 5540
5520 IF IX<X2 OR IX>X2+1 OR IY<Y2-1 OR IY>Y2 THEN 5540
5530 A=PL:B=L:GOSUB 8200:NB=NB+2
5540 IF NB=1 OR NB=3 THEN 5570
5550 IF IX<X1 OR IX>X1+1 OR IY<Y1-1 OR IY>Y1 THEN 5570
5560 A=PL:B=L:GOSUB 8200:NB=NB+1
5570 RETURN
6000 REM ***** SHOT OVER -- SHOW SCORE
6010 GOSUB 8400:A=R:FOR K=1 TO 40:GOSUB 8100:NEXT:SC=0
6020 IF NB<3 THEN PRINT"NO SCORE";:GOTO 6070
6030 SC=3-ABS(CU-3):PRINT"THAT SHOT SCORED";SC:IF P=1 THEN S1=S1+SC
6040 IF P=2 THEN S2=S2+SC
6050 PRINT:PRINT:PRINT:PRINT"SCORE: ";P$(1);"-";S1;
6060 IF NP=2 THEN PRINT" ";P$(2);"-";S2
6070 FOR Q=1 TO 3:GOSUB 8900:NEXT:RETURN
6500 REM ***** PROCESS CUSHION HITS
6510 IF IX>1 AND IX<XR THEN 6530
6520 CU=CU+1:A=BL:GOSUB 8100:DX=-DX
6530 IF IY>1 AND IY<YYU THEN 6550
6540 CU=CU+1:A=BL:GOSUB 8100:DY=-DY
6550 RETURN
7000 REM ***** MOVE CURSOR TO LX,LY
7010 GOSUB 8600:A=R:FOR K=1 TO LX:GOSUB 8100:NEXT
7020 A=U:FOR K=1 TO LY:GOSUB 8100:NEXT:RETURN
7500 REM ***** MOPUP -- END GAME
7510 PRINT:PRINT:PRINT TAB(20);"THAT'S IT -- GOOD GAME! ":"STOP
8000 REM
8010 REM ***** NOTE! - NOTE! - NOTE! - NOTE! *****
8020 REM *
8030 REM * ALL VARIABLES FROM HERE TO THE END OF *
8040 REM * THE PROGRAM MUST BE SET BY THE USER *
8050 REM * TO MATCH HIS SYSTEM *
8060 REM *
8070 REM * -- SEE KILOBAUD ARTICLE --
8080 REM *
8090 REM *****
8095 REM
8100 REM ***** SEND ONE CHARACTER IN VARIABLE A
8110 WAIT IP,W1,W2:OUT OP,A:RETURN
8200 REM ***** SEND TWO CHARACTERS IN VARIABLES A,B
8210 WAIT IP,W1,W2:OUT OP,A:WAIT IP,W1,W2:OUT OP,B:RETURN
8300 REM ***** SEND THREE CHARACTERS IN VARIABLES A,B,C
8310 WAIT IP,W1,W2:OUT OP,A:WAIT IP,W1,W2:OUT OP,B
8320 WAIT IP,W1,W2:OUT OP,C:RETURN
8400 REM ***** HOME UP
8410 A=29:GOSUB 8100:RETURN
8600 REM ***** HOME DOWN
8610 A=28:GOSUB 8100:RETURN
8800 REM ***** CLEAR SCREEN
8810 GOSUB 8400:A=31:GOSUB 8100:RETURN
8900 REM ***** TIME WASTER ROUTINE
8910 FOR K=1 TO 400:NEXT:RETURN
8920 REM
9000 REM ***** THE FOLLOWING VARIABLES ARE SET TO THE DECIMAL
9010 REM ***** EQUIVALENT OF THEIR ASCII CODE. THESE ARE CURSOR
9020 REM ***** CONTROL COMMANDS. SEE KILOBAUD ARTICLE.
9030 REM
9040 R=24:L=25:U=26:D=27:REM MOVE CURSOR RIGHT, LEFT, UP, DOWN
9050 X=88:OH=79:ST=42:SP=32:BL=7:N=0:PL=43:REM X,O,*,SPACE,BELL,NULL,+
9060 OP=1:IP=0:W1=128:W2=128:REM OUTPUT,INPUT PORTS, WAIT 1, WAIT 2
9070 RETURN

```

ed by the program. For example, you would think of a 45-degree angle as a series of cursor movements, one to the right followed by one up. But if the physical length of the movements to the right were not equal to the vertical movement, the apparent angle would become skewed and would not appear correct. The program is able to adjust for this when given the requested ratio.

The best way to determine the ratio for your CRT is as follows. Create the outline of a large square (e.g., a 15 x 15 figure of the character O) on your CRT display. Now measure the actual length and height of this square by using a ruler or tape measure. (Measurements should be from the center of a corner O character to the center of the O character at the appropriate other corner.)

Divide the length of the square by the height to obtain the character ratio requested. In fact, once you have it determined for your system, you might change line 1580 to read simply

1580 SR = 0.52

or whatever constant you have determined.

Last, the dialogue requests the ubiquitous random number to initialize its random-number sequence. See if you can input one you've never used before. Each shot is set up randomly by the program. And with that the game begins, and the palms become even more sweaty.

Troubleshooting

We've put off troubleshooting as long as possible. Now it's time to "fess up." Here are, we hope, most potential problems discussed in a question-and-answer format.

Q: What if I'm missing home up or home down?

A: This is no problem as long as you at least have one of them. A home up could be accomplished by a home down followed by the necessary number of cursor up commands. This would necessitate modifying line 8410. For example, on a system with 22 lines of video output, the new code would be: 8410

GOSUB 8600:A=U:FOR K=1 TO 21:GOSUB 8100:NEXT:RETURN. In a similar fashion, line 8610 would be modified for a system having no home down.

Q: How about no clear screen function?

A: Almost every system with the other control functions should have this capability. If not, it can be simulated with a home up followed by printing enough blanks to clear the screen. The necessary changes are to be made in line 8810.

Q: What special BASIC functions are used?

A: Nothing exotic. Two-letter variable names are used freely. One small string array occurs. The RND, SIN and COS functions are required. The OUT and WAIT statements are the heart of the technique, which brings us to the next question.

Q: What if I'm having trouble with WAIT, OUT and/or I/O ports?

A: If it's simply not knowing your output and/or input (control) port numbers, it's time for a little research. Dust off those manuals (BASIC and hardware) and search. See if you can ask someone with similar equipment. At worst, you can try various numbers for the variables OP and IP. The arguments W1 and W2 of the WAIT statement depend on how your hardware works. Again, consult those trusty manuals.

The function of each WAIT statement is simply to ensure that the CRT is ready for the subsequent transmission of the ensuing OUT statement. If the arguments of the WAIT

statements are causing problems, a little time-waster loop can be substituted for each WAIT. Try replacing each WAIT IP,W1,W2 with the two statements FOR Q=1 TO 10:NEXT. The loop constant 10 is only a starting guess. Its value depends on the speeds of your hardware and software. The number should be large enough to ensure the subsequent OUT will properly work, yet small enough not to waste unnecessary time. You will have to determine this by trial and error. The substitutions are to be made in lines 8110, 8210, 8310 and 8320.

Sharp-eyed readers may be wondering if PRINT CHR\$ could be used in place of each pair of WAIT and OUT statements. The answer is yes, sort of. Here's the problem. After several such successive commands on most machines, the hardware/software issues an automatic carriage return and line feed. This corresponds, of course, to the system's thinking a full line of text has been issued.

However, if WAIT and/or OUT are causing problems try the coding changes in Example 1. Don't forget those semicolons. If you can control the terminal width as an input to BASIC, set it to the maximum. This coding is cleaner, avoiding all problems with port numbers and WAIT arguments.

Q: How much memory is required?

A: The program was written in Altair 8K BASIC, version 3.2. As such, BASIC and the program just fit inside 12K on our sys-

```
8110 PRINT CHR$(A);:RETURN
8210 PRINT CHR$(A);:PRINT CHR$(B);:RETURN
8310 PRINT CHR$(A);:PRINT CHR$(B);
8320 PRINT CHR$(C);:RETURN
```

Example 1.

```
5060 GOSUB 8200:IX=TX:IY=TY
5070 A=ST:B=L:GOSUB 8200:RETURN
```

Example 2.

```
3550 LX=XB:LY=YB:GOSUB 7000:A=AS:GOSUB 8100:RETURN
5060 GOSUB 8200:IX=TX:IY=TY
5070 A=AS:B=L:GOSUB 8200
5080 A=SP:B=L:GOSUB 8200:RETURN
6010 GOSUB 8400:SC=0:PRINT
6050 PRINT:PRINT:PRINT"SCORE: ";P$(1);"-";S1
8110 PRINT CHR$(A);:RETURN
8210 PRINT CHR$(A);CHR$(B);:RETURN
8310 PRINT CHR$(A);CHR$(B);
8320 PRINT CHR$(C);:RETURN
8410 A=19:GOSUB 8100:RETURN
8610 GOSUB 8400:A=17:FOR K=1 TO 24:GOSUB 8100:NEXT:RETURN
8810 A=147:GOSUB 8100:RETURN
8910 FOR K=1 TO 2000:NEXT:RETURN
9040 R=29:L=157:U=145:D=17
9050 X=88:OH=79:AS=42:SP=32:BL=0:N=0:PL=43
9060 REM
```

Fig. 2.

tem. If it overflows on your system and you need to squeeze out a little more space, here's how. The REM statements before line 1000 can be deleted. From line 1000 on, the text after each REM can be removed. However, these latter REM statements must be retained because they are branched to by other statements.

Q: What if my cursor character is inadequate, or I have no cursor?

A: This is remedied by the coding in Example 2. Of course, all the cursor control functions must be available. This coding uses the * as the cue ball.

Q: My friend beats me all the time. What should I do?

A: Go back to Star Trek.

Q: Why does the ball move too fast or too slow?

A: The baud rate of your terminal and quickness of BASIC will determine the speed of the ball. If it moves too fast, add the following time waster:

```
5005 FOR K=1 TO 100:NEXT
```

If 100 does not do the trick, adjust it appropriately. You might need to increase the number 400 in line 8910 also. If things are too slow, not much can be done. The action is limited by the ability of BASIC to do its thing. Altair 8K BASIC was just fast enough to drive our terminal at 30 cps. A faster baud rate would not appreciably change the ball speed.

Q: My CRT resolution is too crude. What's the solution?

A: Not too much can be done about this. If you need a few more cells in the vertical direc-

tion, two blank lines of the scoreboard can be removed. To do this, remove the last isolated PRINT statement from line 2030 and line 2040. Also remove the first two PRINT statements from line 6050.

Q: But what if I still can't get it to work?

A: All we can say is do the following, roughly in this order: Try again. Ask a friend for help. Send us a nice letter. Send us a nasty letter. Buy a \$5000 video system. Take up another hobby.

A Final Word

We hope this pseudographics cursor control technique adds a new dimension to your computer system. There are many other applications for it.

A note to those lazy folks out there. We can provide a cassette tape of the program for \$5. It will be created with Altair 8K BASIC version 3.2 in Tarbell format.

Late Flash for PET Owners

The program changes in Fig. 2 will produce a working version for the Commodore PET.

Since it is a reserved variable, ST in the original listing is changed to AS in these PET modifications. This version will work fine on the PET. However, some additional cosmetic changes and some reformulation would improve its "playability" even more. For \$5 we can supply a cassette of an improved version for the PET. This version, among other things, incorporates more of the PET's graphic capabilities. ■

The BCS and Its President

As president of the Boston Computer Society, Jonathan Rotenberg is, in effect, a lobbyist for the microcomputer industry. Yet in spite of this responsibility, he doesn't even vote.

*Dennis Brisson
John Barry
Kilobaud Staff*

A few months ago, we received, and eventually bought, a program/article from a guy named Jonathan Rotenberg. Aside from noticing that he was president of an organization called the Boston Computer Society, we didn't see anything particularly unusual or striking about the author or the article—after all, we receive scores of manuscripts every month.

A while later, we received another correspondence from Mr. Rotenberg. Like the cover letter that had accompanied the article, and the article itself, this letter was extremely literate, coherent and well presented . . . not a big deal. However, the final paragraph read, in part: "Maybe it would be interesting for me to mention that when I submitted 'Ultra Banner' I was 14 (now I'm 15)." The letter was mailed from a summer camp on Cape Cod and written on Boston Computer Society stationery.

We knew from a press release that the Boston Computer Society was sponsoring a Home/Business Computers show in October at Boston University, so we decided to take a trip to Boston to find out more about Jonathan Rotenberg and the BCS.

In this age of the miracle chip, when "think small" is the keyword of every member of the

microcomputer set, a recent happening, Home/Business Computers '78, may give a boost—in a big way—to Jonathan Rotenberg and to microcomputing in general in the Boston area.

Buoyed by the success of the first Boston Computer Society (BCS)-sponsored exhibit, Rotenberg, the show's organizer and president of the BCS, sees the exposition as becoming an annual event. While other aspiring entrepreneurs have optimistically envisioned similar undertakings after organizing a well-attended first show—only to fail miserably in succeeding attempts—Rotenberg, at age 15, has nowhere to go but up.

By Rotenberg's estimate, Computers '78 attracted about 1000 attendees, mostly novices to the microcomputer phenomenon. "About six months ago, we (the BCS) began to realize that we were not really handling the needs of the general public very well to disperse information about what's going on in the computer field. Our meetings catered very well to hobbyists, but not to the general public. So we developed the idea for Home/Business Computers '78 to direct it toward the general public."

Computer Crusader

Jonathan's enthusiasm for the prospects of computer applications is catching. He took to computers eagerly and at an early age and, with a vision of unlimited growth for the industry, set out to spread the good word about microcomputing. He admits that now "computers are a major part of my

life."

To the uninitiated, Jonathan's excitement about the future uses of microcomputers may be difficult to understand. Indeed, those outside the computer priesthood are not privy to the intricacies and capabilities of memory storage, baud rates, buffers and buses. There appears to be an aura of mystery, misunderstanding and suspicion surrounding the use of computers. Perhaps much of the prejudice is based on a fear of the brute reasoning power of computers.

"In the past I have faced an awful lot of prejudice directed toward the use of computers. People envision computers as massive dehumanizing machines tended by large corporations running checking accounts, taking over their lives and depersonalizing everyone to a number. I think that's rather unfortunate. I see personal computers as inevitable, and people should understand them."

The difficulty of dispelling false impressions associated with computers has been compounded by the type of person the industry can attract. "I've found that a lot of weird people can become involved in computing simply because it seems to be a good way to get them away from other people that they can't deal with," says Jonathan. He is particularly concerned with the image of the "child of the microage," that is, the young computer user. "The problem is that there are a lot of young microcomputer users that tend to be pretentious and overbearing," he frets. While he

is certainly young, Jonathan is neither pretentious nor overbearing.

Jonathan is a highly motivated phenom who appears bent on a one-man crusade to gather as many converts to the micro-computer religion as possible. Under his leadership, the Boston Computer Society has grown from "about 80 people" before the show to "over 220" members since. The faithful include hobbyists, professionals and personal computer users. More converts are on the way. He even has aspirations of convincing the Boston Water and Sewer Commission to join the fold of microcomputer users. He has presented a preliminary proposal—initially turned down by the Commission—to have a microcomputer handle its over 90,000 billing accounts. Although the Commission appears likely to opt for a larger computer system, Jonathan is ever ready to defend his micro approach to computing.

"I see the situation as a little bit different. Microcomputers are different from bigger computers and you can do very different things with them. For instance, in many cases it could be very practical to buy two microcomputers and use one as a spare if the first breaks down. Now obviously you could never do that with the IBM 360. Since microcomputers are so inexpensive—and just as capable as minicomputers—any business considering buying a mini could easily justify the purchase of a more powerful micro."

Jonathan's faith in computing dates back to 1972—he was

nine years old at the time—when he attended a six-week computer programming course. This was the only structured teaching in computing he received; the remainder of his education came from books and from talking with people with computer experience.

Following Childe Jonathan's conversion to computing, he set out on a pilgrimage to learn all he could about computers. "I spent the next two years frantically trying to find computer access. I read some informative books, and the idea of computer programming became exciting. I slowly developed programming styles and techniques as I gradually found computers on which I could run programs I had written."

However, he soon realized that the industry lacked an easy-to-understand instructional book on programming, so he took it upon himself to write one. Although his effort, *Programming in BASIC*, was never published, it was passed on—via mimeographed copies—to over 100 friends and interested beginning programmers. The book is significant in that, besides being a creditable undertaking of a difficult topic by a seventh-grader, it is written in English, rather than computer jargon, and includes various kinds of quizzes and exercises in an attempt "to make programming fun and understandable."

Early Signs of Promise

Jonathan's talent for computing became apparent at the age of nine when he wrote his first computer program. He then began writing various programs and developed his skills to tackle more complicated programming tasks. He estimates that he has written "hundreds of programs," including assorted accounting, graphics, business, demonstration, educational drilling and teaching programs. (His "Ultra Banner" program will appear in *Kilobaud* later this year.) He has programmed on maxi, mini and microcomputers but is most excited about micros because of their low cost and versatility

and the technological breakthroughs occurring every day in the microcomputer field.

At the ripe old age of 13, he landed a summer job at a data-processing center on Cape Cod, where, Jonathan says, after his first summer there, "I guess they were impressed with my performance because they asked me back the following summer." He was instrumental in introducing the staff to the capabilities of microcomputing. He has also taught programming, as well as some computer design, to high-school students and to summer campers. At both the high school and summer camp, Jonathan, after researching the systems, drawing up cost- and time-effective analyses and presenting his detailed findings to the respective institutions, was the driving force in convincing the institutions to explore programming. He sold the camp on renting a Wang computer, and eventually on buying a PET.

A brief look at Jonathan's family background may help explain his motivations and skills. His mother runs a retail store and has an art background. He points out that he

does advertising, design and layout for the BCS—he organized most of the promotional work for the show—saying, "I didn't use computer type-styles. I wanted to give the impression that human beings are involved."

Jonathan's father is in real estate and owns a motel. The son is now trying to convince the father to use computers in his business. He would like to organize a "huge TRS-80 system" to help in the motel's management.

At times Jonathan sounds overeager about the prospects for computer advances. However, he has nurtured this youthful optimism, seasoned with years of experience, into a mature and realistic approach to the future of microcomputing.

In response to criticism of the lack of software for microcomputers, thus making them impractical in light of minicomputer capabilities, Jonathan predicts that the spawning microcomputer industry will give rise to a whole new industry of software consultants to custom-program.

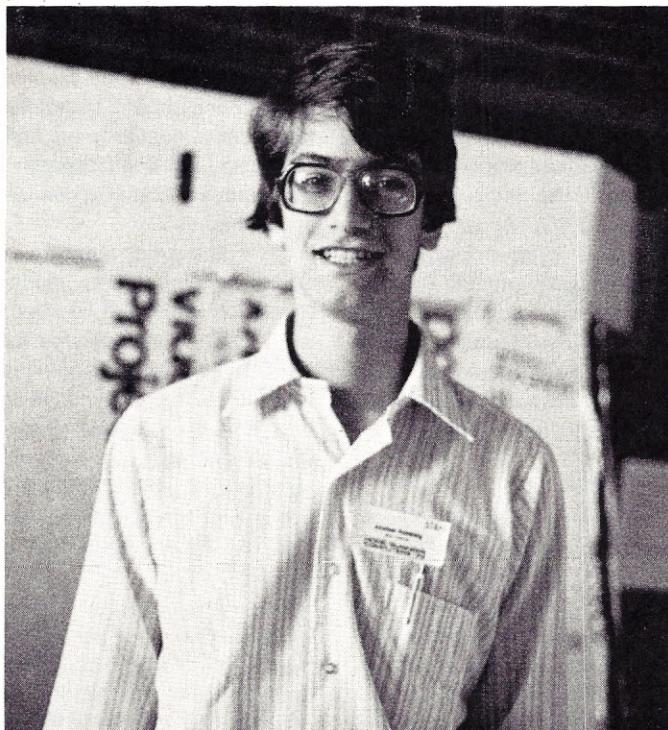
"I see the need for a consultant as an integral part of a microcomputer that arranges all

of the hardware, service and software needs. I don't think that there can ever be canned software that will be ideal for the application. As programmers become more plentiful—and particularly the way things seem to have started in microcomputing—you wouldn't pay someone \$50 per hour to do programming like you would with large computers. Also, microcomputing is much easier. I think there is certainly a definite need for canned software, but I think there is more of a need for this sort of all-inclusive consultant."

Jonathan on the future uses of microcomputers: "I think the microcomputer situation is coming into a very fuzzy turning point. The majority of computer use in the home is for game playing, particularly influenced by advertisements for things that look like computers, such as TV games. But I think that's starting to change. People are doing more practical things with computers. I think that probably in another two years the change will be very definite."

The Boston Computer Society

Through the realization that "there was very little information available to microcomputer users in the Boston area," Jonathan formulated the idea for a Boston-based computer society. Despite the Hub City's reputation as a beehive of intellectual stimuli, there wasn't much organized activity for the computer user. Jonathan asserts, "People assume that with all the colleges in the city, there must be activity available. But the fact is that most of the computer-related groups at the schools are very self-sufficient. In fact, we get very few students at our monthly meetings." (He indicated that he wouldn't want to see nothing but technically oriented college students at the show.) He goes on to cite that computer people, on the whole, tend to be very independent, and it has been his experience that most people don't like to commit themselves to any sort of organizational club or information ser-



Jonathan Rotenberg: overcoming prejudice.

vice. But that has started to change. As the growth of the industry has increased and more people have purchased computers, a new breed—more open to an exchange of computer-related ideas and applications—has emerged.

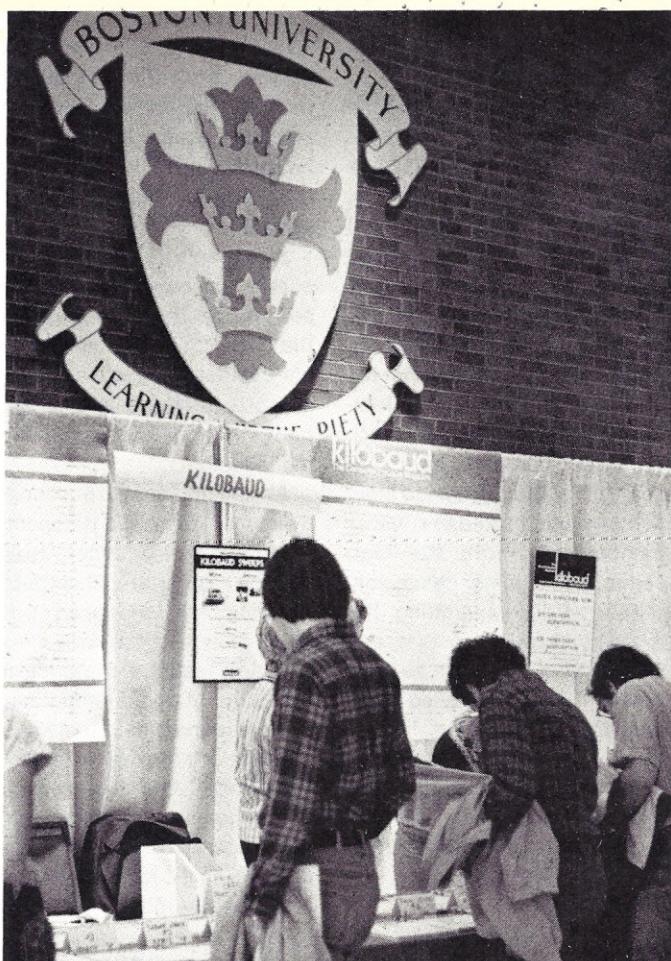
Together with noted Boston computer activist Richard Gardner, Jonathan formed the local computer club, which held its first meeting in January 1977. After only the second meeting, Jonathan found that the presidency of the chapter was thrust upon him after Gardner's "interests changed" as his time was taken up with other projects.

Jonathan recalls that, at the age of 13, having never chaired a meeting, he was understandably nervous. He laments, "It was very discouraging because no one was devoting any time to the club, so I was doing everything. I just kept asking myself, 'was it really worth it?' I stuck with it." Jonathan admits that his term as president, while initially a one-man show, has been made easier with the recent formation of a board of overseers.

The monthly meetings feature guest speakers, various information exchanges, free literature, magazines, etc. Because BCS is based upon the constantly changing needs of its members, the program varies at each meeting. "We are constantly updating our services to provide as much information as possible to computer users," he states.

Indeed, Jonathan is continually working toward making the club bigger and better with plans for a newsletter, users groups and even the formation of "Boston Computer Society International," an idea that has met with some resistance from some members who prefer the "homey" quality of the present meetings. "What I'm trying to do now is see if I can handle both goals at once—give people whatever information they want and still retain a comfortable, cozy atmosphere. It's been working pretty well," he boasts.

As the industry has changed,



One of the exhibits at Home/Business Computers '78.

so has the type of attendee at the monthly meetings. "Personal" users now outnumber the hobbyist and businessman. Jonathan muses, "I see the Boston Computer Society now as a middle-of-the-road club—in between the neophyte and the advanced computer hobbyist. For the more advanced, technical computer hobbyist, the best service around is probably the New England Computer Society." (Located in Bedford MA, NEC features a newsletter and "special interest groups to conduct projects and discuss topics in depth.")

The Show

Computers '78, by far the club's most ambitious undertaking, was initially viewed as a service by the club, rather than a money-making proposition. Fee charges for the show were nominal (\$25 for a booth and \$2 general admission charge). The club netted \$600, according to Jonathan.

Attendance at the show was described as "very comfortable"—not too crowded but with enough interested onlookers to keep the exhibitors on their feet all day. The problem of attracting enough customers to the show, geared to the first-time user, while not appearing too commercial was a concern of Jonathan's.

"We took great pains to invite only high-quality exhibitors. From our point of view it was an information service, but it has to be profitable and useful for the exhibitors or else we have not done our job." (One of the exhibitors was *Kilobaud* publisher, Wayne Green, who noted that subscription sales were relatively substantial at the show.)

The show has been the culmination (so far) of Jonathan's interest in computers, which grew out of a "fascination" at an early age "with things with buttons." Since then, he has mastered the controls to over-

come the barriers that one so young and so talented can face in the computer business world. Although he still has a year of high school remaining, and then perhaps years of college before him, he gives the impression of one much older.

"My primary goal in a business transaction is to let people know that I'm a responsible person, someone who knows what he's doing and people can have confidence in. I like to do things well—I'm a perfectionist. If something's not the best it can be, I'm not satisfied.

The Spice of Life

What's in store for Jonathan? When he is not busy programming at the keyboard, Jonathan is tackling some sort of computer-related organizational job, such as Computers '78. He sees himself as an organizer and a programmer, but has become more of an organizer than a computer user; he now only writes programs as they are needed for applications.

As evidence that he's "liked taking on big organizational things": Jonathan persuaded a major computer company to underwrite most of the show's operating expenses. As we talked, BCS members approached their president to ask his advice on logistical, scheduling and other matters. He was very busy.

It could be difficult for one so young who has accomplished so much to catalog his achievements unassumingly. Jonathan is honest yet modest about his accomplishments. He's also a nice kid.

With his proclivity toward computers, Jonathan seems destined to become a computer technician, programmer or consultant or land some "big organizational job." For now, however, he dares to tempt fate and adamantly predicts, "I keep telling myself, no, I'm going into some other field." Another field he has gone into is magic. "Professional Magic, Amateur Prices" reads his business card. A "mostly self-taught" magician, he gave his first professional show at age 11.

A nearly monomaniacal ap-

proach seems, in Jonathan's case, to be the key to diversity. "When I get involved in something, I tend to give it priority over everything else." This attitude has paid off. Balancing his time among his myriad interests illustrates his legerdemain talents.

Computer user, programmer, teacher, author, organizer, magician, Rotenberg is a Renaissance man/child in the computer field. "The thing I consider most important is to know as much as I can about everything about computers. This is where I am particularly different from a lot of other people who have their specialization in hardware or software. It's been very use-

ful because I'm able to talk with anyone and answer any questions that people might ask... or if someone is telling me something, I'm able to understand and offer additional information."

As both computer user and organizer, Jonathan's accomplishments, knowledge of computers and the mature and responsible manner in which he deals with people belie his age. He admits to having developed a "phone voice" and doing as much correspondence as possible by mail in order to disguise his youth.

How does a fifteen-year-old confront corporations and

businessmen when organizing for an event? "I've had trouble in the past with people who would feel a little uneasy if I'm talking about something that might cost them money. I have to give the impression a lot of the time that I am a businessman. About 99 percent of the time my phone voice is convincing." In fact, many of the exhibitors at Computers '78 had never personally met the young organizer, and when Jonathan introduced himself to the exhibitors before the show, some were momentarily taken aback.

Up to now, Jonathan has resisted the temptation, at the urgencies of his friends, to "go national" with his computer ex-

position. However, with this year's success, you may run into Jonathan on the circuit next year. Even before the show, Jonathan predicted that he would move his show, held this year at Boston University's student union, to more spacious quarters next year. Jonathan's prediction, not to be lightly dismissed as the boasting of a brash upstart, is backed by his consummate organizational ability and seasoned, despite his youth, by a mature understanding of the transient nature of this fast-growing and ever-changing industry. Jonathan, like the microcomputer industry, has come of age. ■

PET SCHEMATICS

Another First From "PET-SHACK".

For only ~~\$34.95~~ you get: NOW \$24.95

24" x 30" schematic of the CPU board, plus oversized schematics of the Video Monitor and Tape Recorder, plus complete parts layout—all accurately and painstakingly drawn to the minutest detail.

PET ROM ROUTINES

Another Breakthrough From
"PET-SHACK".

For only \$19.95 you get:

Complete Assembly listings of all 7 ROMs, plus identified subroutine entry points; Video Monitor, Keyboard Routine, Tape Record and Playback routine, Real Time Clock, etc.

To entice you we are also including our own Machine Language Monitor program for your PET using the keyboard and video display.

You can have the Monitor program on cassette for only \$9.95 extra.

Send check or money order

TO: PET-SHACK Software House
Marketing and Research Co.
P. O. Box 966
Mishawaka, IN 46544



THE BASIC HANDBOOK TELLS ALL.

From the author of the widely acclaimed TRS-80 Users/Learners Manual comes the BASIC Handbook. It **TELLS ALL** you need to know about 250 BASIC statements, commands, functions and operators.

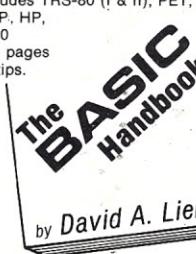
Can't understand those BASIC programs that appear in magazines? Can't get that favorite program to run on your computer? The BASIC Handbook **TELLS ALL**.

"The Handbook" includes TRS-80 (I & II), PET, Apple, DEC, OSI, SWTP, HP, Altair, IMSAI and over 50 more! 360 Easy-to-read pages packed with facts and tips.

✓ C109

Send \$14.95 + \$1.35 P&H
(CA + 6%) to:
COMPUSUPPORT Publishing
8662 Dent Drive - K1
San Diego, CA 92119
(Or write for flyer)

Dealer inquiries invited.



SOL-20 SOFTWARE

from ESV Computer Service



Processor Technology

DIAGNOSTICS II: Checks user RAM (addresses are keyboard selectable by operator), video RAM, SOLOS or Boot-load RAM, audio interface, and personality module. Features hard-copy printout of video displays using TAB key, and selectable output ports. Cassette tape comes with SOLOS version on one side & Bootload (BOOTL) on the other for use with either cassette or Helios SOL Systems \$50. on cassette

DISASSEMBLER: Allows conversion of machine language programs to assembly language. Features operator selectable output ports for hard-copy printer or video display and audio cassette storage of disassembled text. Permits modification to be made for custom use or possible relocation. Symbol table may be anywhere in RAM and is assigned by the operator during initialization. Line numbers and labels are automatically assigned by the disassembler during construction of the assembly language program. Special characters will be displayed in the line number's most significant digit to flag the need to divide the machine code for 2 or more passes when the line number exceeds 9999. Tape storage (if selected) is done byte-by-byte (text) for use with assemblers other than ALS-8 or Software #1 \$30. on cassette

MAILBOX: A mailing list program designed to work on your Helios Disk System. Features online editing for data entry, operator may select serial or parallel drivers (included on diskette) for hard copy, pre-sorted mailing labels (by zip codes as required by postal regulations for bulk mailing), label search, modification of single line should address or name need changes, file status check to determine amount and percentage of "dead space" and number of names in file, file compression to remove data in the same size file, generate separate diskette to increase data storage, will dump files to either 2 or 4 columns on printer, and is operator selectable \$45. on Helios diskette

DROIDS: An action game where you play the computer. Try to escape Droids by hiding behind fences. Features static practice mode for skill development and real time attack mode with selectable difficulty factors \$19.50 on cassette

ALS-8 UTILITIES adds cassette I/O operations to ALS-8. Included are seven custom tape commands and five clear memory commands. Source program on cassette will assemble into 12C (hex) bytes. EC-001 Source program on cassette tape \$15.00

SOFTPAC #1 cassette uses Basic/5 on any Sol-20/SOLOS with 16K of RAM. Included are four games, STAR, BLACKJACK, CRAPS, and WAR. EC-002 Basic/5 programs on cassette tape \$18.00

BLOCKADE is an action game for two players on the same keyboard. Build a wall as you move and trap your opponent. Get sound effects through an AM radio or the Music System. Machine language program runs in 8K of RAM. EC-003 Machine language program on cassette \$14.00

SOL-20 DIAGNOSTIC checks user RAM, system RAM, SOLOS, keyboard, video, and cassette interface. This machine language program requires 8K of RAM. EC-004 Machine language program on cassette \$45.00

CALENDAR & TIME has a calendar for whatever month and year you want. Also included is a time program which displays hours, minutes, and seconds on the screen. These Basic/5 programs require 16K of RAM. EC-005 Basic/5 programs on cassette tape \$10.00

DIRECT REDUCTION LOAN provides amortization schedule for entire loan period or a single period of interest. Total interest paid is also calculated. 12K of RAM is required for this Basic/5 program. EC-006 Basic/5 program on cassette tape \$10.00

ACCOUNTS RECEIVABLE uses cassette data files to keep customer information on cassette tape. Functions include update, report, search, and enter new records. 20K of RAM and 2 cassette recorders are required to run this Extended Cassette Basic Program. EC-007 Basic program on cassette tape \$25.00

SMARTMOUTHED BLACKJACK uses Las Vegas rules including split hands, double down, and insurance bets. The humorous wise-cracks of the dealer keep the attention of the player for hours. This Extended Cassette Basic program requires 32K of RAM. EC-008 Basic program on cassette tape \$19.50

BIORHYTHM cassette produces complete plot or a simple list of critical days. Output can be directed to any pseudo port. Extended Cassette Basic version requires 24K. Basic/5 version requires 16K. Any number of days can be forecast. EC-009 Basic/5 program on cassette tape \$19.50
EC-010 Extended Cassette Basic program cassette \$19.50

IMMEDIATE DELIVERY!

All items shipped from stock. First generation recordings.

One Year Warranty!

All above items on 1200 baud CUTS cassette.

All orders COD or prepaid. Allow 3% for freight if prepaid. Texas residents add 5% sales tax. Write for catalog. Dealerships available.

COMPUTER PORT ✓ C80

926 N. Collins • Arlington, TX 76011 • (817) 469-1502

Brian E. Bateman
PO Box 399
Sharpes FL 32959

Sherman P. Wantz
424 NW Lakeview Drive
Sebring FL 33870

Address List Editor

Back in October (page 102) we told you to keep an eye out for this article. Here it is.

The editor program described in this article complements the Address List Program that appeared in the October 1978 issue of *Kilobaud* ("A Useful Address List Program," p. 102).

The program allows you to prepare an address list and record it on cassette tape in a format appropriate for later loading directly into the address list program. In addition, it allows you to update your taped address list by: changing names, addresses, telephone numbers and birth dates; adding or deleting correspondents; and preparing a cassette tape record of your original and revised address lists.

If you correspond with only a small number of people, you might consider configuring your address list program to introduce addressee information via DATA/READ statements.

But if you have a large personal correspondence list or if you intend using your taped address program in connection with a social club's membership list or as a small business's customer file, you will certainly appreciate the value of being able to revise your file without having to retype it.

The editor program prompts

you through each step of the address list construction process (see Samples 1 through 5). If you follow the instruction sequence that appears on your computer system's video monitor, you should experience no difficulty in producing a taped catalog of correspondents that will be compatible with the address list program.

Tailoring the Program

If you wish, you can reduce the temporary (RAM) memory requirements of the program by removing individual parts or by excising entire sections of the editor program.

For example, if you merely want to prepare a tape containing names, addresses, telephone numbers and birth dates to feed into your address list program and forego the edit capability, you can eliminate these options: edit information; delete an addressee; add an addressee; and read address list from tape.

Those deletions would substantially cut the program's memory requirements. However, by so doing, you would give up the capability of updating your master list by making needed changes. The probable alternative: retype the

entire list.

Again, if you must cut the program because of memory limitations in your particular system, the editor program's modular construction will help you do it. Line 300 tells you where to find the various modules. For example, the "edit information in list" option begins at line 660 and ends at line 1150; the "delete addressee" option begins at line 1160 and ends at line 1350; etc.

If your working memory space is small after you load BASIC and the editor program, you can limit the quantity of address data you place into memory at any one time. Merely indicate approximately how many names your remaining memory bank can accommodate, and the program will remind you to transfer to tape the information you have typed in at your keyboard when you have reached your self-imposed limit.

Lines 140 to 160 ask you to define the data input limit. Line 170 adds a few bytes to the designated limit so that you can use the "add names to list" option without mishap. Lines 1410 to 1440 include a reminder to record (dump to tape) the block of names in memory, thereby freeing space needed for the next

block of names. Line 1440 "transfers" you to line 190 so that you can select option 6, "copy list in memory to tape" and, thereby, record your list of correspondents on cassette tape.

Throughout the program (lines 190, 320, 360, etc.) you will find statements "PRINT CHR\$(16), CHR\$(22)." These commands cause the computer system's cursor to "home up" (jump to the upper left corner of the video monitor's screen) and cause all information appearing on the face of the CRT to be erased (erase to end of frame). If you use the scroll mode of presentation with your monitor or use a printer as your output device, you can remove all such statements and save program memory.

Exercise Care

If you decide to remove all cursor control and clear screen commands, do so carefully. If other statements, commands or functions presently share program lines with the "PRINT CHR\$(16), CHR\$(22)" statements, be sure to leave them there. Furthermore, try to avoid eliminating any program line number until you have checked to be sure that the line number

TYPE THE NUMBER OF NAMES YOU WANT TO READ
FROM TAPE--OR RECORD ON TAPE--AT ONE TIME.

HOW MANY NAMES ? 5

TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS TO:
1--PREPARE A NEW ADDRESS LIST
2--EDIT INFORMATION IN LIST
3--DELETE AN ADDRESSEE
4--ADD AN ADDRESSEE TO LIST
5--LIST ALL ADDRESSEES
6--COPY LIST IN MEMORY TO TAPE
7--READ ADDRESS LIST FROM TAPE
8--EXIT FROM EDITOR PROGRAM

INSTRUCTION ? 1

TYPE NAME USING THIS PATTERN: LAST NAME, FIRST
NAME, MI.(XXXXXX;XXXX X.). PLACE A '*' IMMEDIATELY
AFTER NAME ENTRY IF PERSON IS ON YOUR XMAS CARD LIST

TYPE '9' IF THERE ARE NO MORE NAMES
TO BE ADDED TO YOUR LIST.

NAME ? ABLE; FRANK R.*

TYPE STREET ADDRESS--PATTERN NOT IMPORTANT

STREET ADDRESS ? 123 RANDOLPH RD.

TYPE CITY; STATE AND ZIP CODE
USING THIS PATTERN: XXXXX;XX-XXXX

CITY;STATE AND ZIP CODE ? ATLANTA;GA.33333

TYPE PHONE NUMBER--PATTERN NOT IMPORTANT
IF PHONE NUMBER IS NOT KNOWN, HIT 'RETURN' KEY

PHONE NUMBER ? 400/555-5555

TYPE BIRTHDATE. USE MONTH-DAY-YEAR PATTERN:
XX-XX-XX. IF BIRTHDATE IS UNKNOWN, TYPE 00-00-00

BIRTHDATE ? 03-23-45

IF NEXT PERSON TO BE LISTED LIVES WITH LAST ADDRESSEE
ENTERED, TYPE A 'Y'; OTHERWISE HIT 'RETURN' KEY

'Y' OR 'RETURN' ? Y

TYPE NAME USING THIS PATTERN: LAST NAME, FIRST
NAME, MI.(XXXXXX;XXXX X.). PLACE A '*' IMMEDIATELY
AFTER NAME ENTRY IF PERSON IS ON YOUR XMAS CARD LIST

TYPE '9' IF THERE ARE NO MORE NAMES
TO BE ADDED TO YOUR LIST.

NAME ? ABLE; RUTH C.

TYPE BIRTHDATE. USE MONTH-DAY-YEAR PATTERN:
XX-XX-XX. IF BIRTHDATE IS UNKNOWN, TYPE 00-00-00

BIRTHDATE ? 12-22-46

Sample 1. Program printout showing how address list is prepared using editor program. Underlined entries indicate operator responses to program questions.

to be removed is not referred to
elsewhere in the program.

If, despite your caution, you
happen to eliminate a line num-
ber that is needed, relax. Your
computer will call the oversight
to your attention when you
"RUN" the program by sending
a "line number not found" error
message. You will be able to
correct the problem at that
time.

Note that a semicolon sepa-
rates the last name from the

first name (line 370) and also
separates the city name from
the state abbreviation (line
470). Although commas would
have been the preferred punctua-
tion in both instances, the
BASIC interpreter did not per-
mit it. SWTP BASIC has been
programmed to consider a
comma as signaling the end
(terminator) of a string variable
entered in response to an IN-
PUT statement.

If you want to type a comma

after your correspondent's last
name (line 370), test your
BASIC version to see whether it
causes you to lose the first
name. If a comma terminates
your entry, type a semicolon,
dash, colon or some other char-
acter after you type the sur-
name. You will meet the same
problem when you enter your
correspondent's city, state and
zip code (line 470). Unless your
version of BASIC permits it, do
not type a comma after you
enter the name of your ad-
dressee's city.

If you forget and proceed to
type commas in either of these
two places—it's the natural
thing to do—you will notice
truncated(shortened) names or
addresses appearing on your
monitor's screen whenever you

run the program. When you see
that result (assuming that you
haven't exceeded the allowable
length of your string variables),
you will know why the truncation
occurred.

Notice in line 470 that the
city, state and zip code entry
pattern requires the use of a
two-letter abbreviation for the
state's name. Since not every-
one is familiar with all of the of-
ficial two-letter state abbrevia-
tions, we have included a list of
state abbreviations approved
by the U.S. Postal Service (see
Table 1).

This editor program requires
you to follow closely the desig-
nated city, state and zip code
pattern. The pattern is: city
name, semicolon, two-letter
state abbreviation, period (or

TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS TO:
1--PREPARE A NEW ADDRESS LIST
2--EDIT INFORMATION IN LIST
3--DELETE AN ADDRESSEE
4--ADD AN ADDRESSEE TO LIST
5--LIST ALL ADDRESSEES
6--COPY LIST IN MEMORY TO TAPE
7--READ ADDRESS LIST FROM TAPE
8--EXIT FROM EDITOR PROGRAM

INSTRUCTION ? 2

WHICH ADDRESSEE NUMBER IN YOUR LIST DO YOU WISH TO EDIT?

ADDRESSEE LIST NUMBER ? 2

TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS
TO INDICATE THE ELEMENT YOU WISH TO EDIT:

1--NAME OR XMAS CARD LIST CODE
2--ADDRESS
3--PHONE NUMBER
4--BIRTHDATE
5--END EDIT OPERATION

INSTRUCTION NUMBER ? 1

ABLE; RUTH C.

TYPE NAME USING PATTERN: XXXXX;XXXX X.

IF PERSON NAMED IS ON YOUR XMAS CARD MAILING
LIST, ADD '*' IMMEDIATELY AFTER THE NAME.

NAME ? ABLE; RUTH C. *

WHICH ADDRESSEE NUMBER IN YOUR LIST DO YOU WISH TO EDIT?

ADDRESSEE LIST NUMBER ? 1

TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS
TO INDICATE THE ELEMENT YOU WISH TO EDIT:

1--NAME OR XMAS CARD LIST CODE
2--ADDRESS
3--PHONE NUMBER
4--BIRTHDATE
5--END EDIT OPERATION

INSTRUCTION NUMBER ? 5

Sample 2. Program printout showing edit process. Underlined entries indicate operator response to program questions.

TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS TO:

- 1--PREPARE A NEW ADDRESS LIST
- 2--EDIT INFORMATION IN LIST
- 3--DELETE AN ADDRESSEE
- 4--ADD AN ADDRESSEE TO LIST
- 5--LIST ALL ADDRESSEES
- 6--COPY LIST IN MEMORY TO TAPE
- 7--READ ADDRESS LIST FROM TAPE
- 8--EXIT FROM EDITOR PROGRAM

INSTRUCTION ? 3

TYPE NUMBER ASSIGNED TO ADDRESSEE YOU WISH TO DELETE

ADDRESSEE NUMBER ? 3

3 ABLE; BILLY 123 RANDOLPH RD.
ATLANTA; GA. 33333 400/555-5555
06-04-70

TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS:

- 1--DELETE ADDRESSEE SHOWN ABOVE
- 2--DELETE DIFFERENT ADDRESSEE
- 3--RETURN TO MAIN PROGRAM

INSTRUCTION NUMBER? 1

TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS TO:

- 1--PREPARE A NEW ADDRESS LIST
- 2--EDIT INFORMATION IN LIST
- 3--DELETE AN ADDRESSEE
- 4--ADD AN ADDRESSEE TO LIST
- 5--LIST ALL ADDRESSEES
- 6--COPY LIST IN MEMORY TO TAPE
- 7--READ ADDRESS LIST FROM TAPE
- 8--EXIT FROM EDITOR PROGRAM

INSTRUCTION ? 5

1 ABLE; FRANK R.*	123 RANDOLPH RD.
ATLANTA; GA. 33333	400/555-5555
03-23-45	
2 ABLE; RUTH C. *	123 RANDOLPH RD.
ATLANTA; GA. 33333	400/555-5555
12-22-46	
3 DELETED	DELETED
DELETED	DELETED
4 BAKER; CARL F.	PO BOX 123
BALTIMORE; MD. 21111	300/444-4444
00-00-00	

TO CONTINUE, PRESS 'RETURN' KEY
?

5 BAKER; MILDRED	PO BOX 123
BALTIMORE; MD. 21111	300/444-4444
09-27-55	

--END OF LIST--PRESS 'RETURN' KEY
?

Sample 3. Example of deletion operation.

space) and five-numeral zip code. The pattern is significant because the companion address list program has been instructed to count to the left (using the LEFT\$ function) to search for the name of a state. If you were to omit one of the zip code numbers or place an extra character between the state abbreviation and the zip code, you would get an erroneous output from your attempted search. Use the correct pattern (e.g., Peterborough; NH.03458), and you should experience no problem with the address line.

One final potential "booby

trap" that the exercise of care can help you avoid is contained in line 550. If you do not know your addressee's birth date, enter: "00-00-00." Notice that the birthdate requires the use of eight characters (six numerals plus two dashes, or spaces). If you know your correspondent's birth month but don't know his/her birthday or birth year, fudge a bit. Guess. Type in the approximate day and year. The address list program will use the dates you enter to calculate the addressee's age. You will remember (we hope) that the age shown is only your guess.

State	Abbr.	
Alabama	AL	correspondent's street address, city, state and zip code and telephone number and enters that information for you.
Alaska	AK	
Arizona	AZ	
Arkansas	AR	
California	CA	
Colorado	CO	
Connecticut	CT	
Delaware	DE	
Dist. of Colum.	DC	
Florida	FL	
Georgia	GA	
Hawaii	HI	
Idaho	ID	
Illinois	IL	
Indiana	IN	
Iowa	IA	
Kansas	KS	
Kentucky	KY	
Louisiana	LA	
Maine	ME	
Maryland	MD	
Massachusetts	MA	
Michigan	MI	
Minnesota	MN	
Mississippi	MS	
Missouri	MO	
Montana	MT	
Nebraska	NB	
Nevada	NV	
New Hampshire	NH	
New Jersey	NJ	
New Mexico	NM	
New York	NY	
North Carolina	NC	
North Dakota	ND	
Ohio	OH	
Oklahoma	OK	
Oregon	OR	
Pennsylvania	PA	
Rhode Island	RI	
South Carolina	SC	
South Dakota	SD	
Tennessee	TN	
Texas	TX	
Utah	UT	
Vermont	VT	
Virginia	VA	
Washington	WA	
West Virginia	WV	
Wisconsin	WI	
Wyoming	WY	

Table 1. Listing of state names and abbreviations approved for address use by the U.S. Postal Service.

As long as the month of birth is known and appears as the first two digits of the eight-character birth date group, the address list program will search for and list all of your correspondents whose birthdays occur in the month you designate.

Other Program Details

Program lines 330 to 350 and 580 to 600 allow you to enter information pertaining to relatives of your correspondent into your list. All you need to do is type in the relatives' names and birth dates. The editor program refers to your principal

An asterisk placed after your correspondent's name (lines 370 to 380) is used as a "flag" to indicate that he or she is on your Christmas-card mailing list. The companion address list program searches for the asterisk placed on the name line whenever you instruct it to identify those on your Christmas-time exchange list.

Of course, with appropriate address-list-program modifications, you could, if you wished, use the asterisk to indentify current, past or paid-up members of a club or to show preferred business customers.

In lines 380 and 390 you are asked to type a "9" in lieu of a name whenever you have completed making entries in your address list. The "9" signals the computer to return you to the executor (list of eight options) to review the list in memory (option 5) before you exercise the record option (6) to transfer the last block of correspondent data to your cassette tape file.

The statement "PRINT CHR\$(18)" in line 1640 turns on the cassette tape motor for recording, and "PRINT CHR\$(20)" turns off the motor when the record sequence has been completed. You should substitute your own motor-control commands in lines 1640 and 1786 if they differ from the ones used by the SWTP M6800/AC-30 recorder interface. Similarly, "PRINT CHR\$(17)" in line 1900 commands the AC-30 to turn on the recorder for "loading" the address list into memory. "PRINT CHR\$(19)" at line 2020 commands shutoff of the recorder motor.

You may not need to be reminded to prepare your tape recorder to receive the address list as it is dumped. In that case, you can remove lines 1610 to 1630. And if you feel that the reminders contained in lines 1860 to 1880 insult your intelligence, feel free to remove them also. These statements were added to the program only after we had repeatedly failed

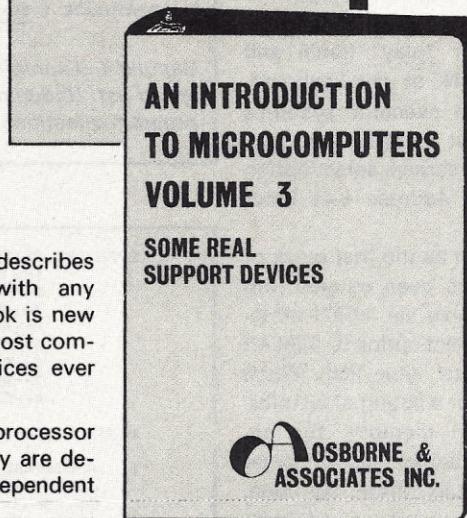
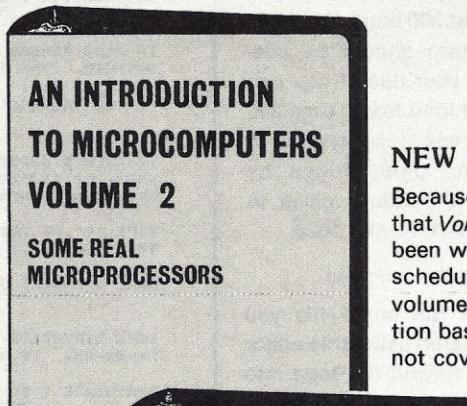
Announcing two NEW books...

There are hundreds of microprocessor books on the market today, but there's none like *An Introduction to Microcomputers: Volumes 2 and 3*. These books provide the only detailed descriptions of real products from an independent source.

NEW MICROPROCESSORS

Volume 2 — Some Real Microprocessors describes individual microprocessors and support devices commonly used only with the parent microprocessor. The new edition represents a massive expansion of our previous Volume 2; among other new material it includes the first detailed description of the Intel 16-bit microprocessor.

Approximately 1400 pages.



NEW SUPPORT DEVICES

Volume 3 — Some Real Support Devices describes support devices that can be used with any microprocessor. The majority of this book is new material; in particular it has one of the most comprehensive discussions of memory devices ever printed. Approximately 700 pages.

Between *Volumes 2 and 3*, every microprocessor and most support devices available today are described—in detail, and from an independent source.

NEW UPDATES

Because of the tremendous amount of material that *Volumes 2 and 3* must cover, these books have been written to be updated on a regular bimonthly schedule. Six update sections for each of the two volumes may be purchased on a yearly subscription basis. Each update will describe new products not covered in the original volumes; updates also provide additional information for products already included, and errata pages for previous text. Any update subscription order for a 1978 edition will apply to the entire 1978 update series. Customers who subscribe after the initial updates have been issued will receive all previous updates in the series.

NEW FORMAT

For your convenience, *Volume 2* and new *Volume 3* of *An Introduction to Microcomputers* are available now; bimonthly updates for both volumes are being issued. To order these or to inquire about other Osborne & Associates publications, complete the convenient order form below.

 **OSBORNE & ASSOCIATES, INC.**
P.O. Box 2036 DEPT. D9B
Berkeley, California 94702
U.S.A.

*Price increase applies to all orders postmarked on or after January 1, 1979.

(415) 548-2805
TWX 910-366-7277

	PRICE	QTY	AMT
14-4 Volume 2 — Some Real Microprocessors 1978 Edition, with binder	\$20.00 *after 1/1/79: \$30.00		
15-2 1978 Edition, without binder	\$15.00 *after 1/1/79: \$25.00		
16-0 Binder Alone	\$ 5.00		
Volume 3 — Some Real Support Devices 17-9 1978 Edition, with binder	\$20.00		
18-7 1978 Edition, without binder	\$15.00		
19-5 Binder alone	\$ 5.00		
Volume 2 and 3 Updates 1978 Edition (subscription to six issues of each series)	\$40.00		
Volume 2 Updates only, 1978 Edition (six issues)	\$25.00		
Volume 3 Updates only, 1978 Edition (six issues)	\$25.00		
	TOTAL Sales Tax (Calif. residents only)		
	Shipping Charges		
	TOTAL AMOUNT ENCLOSED		

* 6 1/2%, SF Bay Area residents only
• 6%, California residents outside SF Bay Area
• Payment in advance must be enclosed for purchases of up to \$70.00. Invoicing for purchases of \$70.00 or more in the U.S.A. available upon approval of your account. All foreign orders must be prepaid in U.S. dollars drawn on a U.S. bank.

NAME _____

CITY _____

STATE _____ ZIP _____

PHONE _____

SHIPPING CHARGES: Shipping for large orders to be arranged.

UPDATE SUBSCRIPTIONS:

All foreign orders \$4.00 per 6-issue subscription for airmail
 No extra charge in the U.S. - 4th Class Mail ONLY.

BOOKS:

All foreign orders, \$3.00 per book, for air shipment
 4th class \$0.35 per book (allow 3-4 weeks within USA, not applicable to discounted orders)
 \$0.75 per book, UPS (allow 10 days) in the U.S.
 \$1.50 per book, special rush shipment by air in the U.S.

Please send information on:

Other O&A publications
 Becoming an O&A dealer
 School discounts
 List of foreign distributors
 More information on Volumes 2 and 3

to: set the baud rate switches to 300; check the AC-30 motor switch positions; press the recorder's control levers; and rewind the tape in the cassette.

Using INPUT Statements

The routine found between lines 1850 and 2020 allows you to load your recorded address list into the editor program for checking or updating. As you can see (lines 1930 to 1980), information is loaded into the editor program from tape using BASIC's INPUT statement. When a program sequence meets an INPUT statement, a question mark appears on the video monitor screen, and the computer waits for data to be entered—usually typed in by the operator at the system's terminal keyboard.

Not generally recognized is that data requested by an INPUT statement can be prerecorded and supplied to the computer through a tape cassette's interface port. The procedure to accomplish this is only slightly "tricky," but it works reliably once you understand and apply the principle. The secret of making an INPUT statement work to give you access to taped information files rests heavily on using properly timed FOR/NEXT loops.

The tape you prepare using the editor program will be used to provide names, addresses, phone numbers, etc., to the address list program as well as to the editor program itself (for review and revision) in response to INPUT statements. Therefore, you will have to introduce appropriate delays between elements of the address information as you record them on tape.

Line 1670 calls for a subroutine delay loop of 500 at line 1790. This rather long pause gives the tape recorder motor an opportunity to start and stabilize. It also allows the INPUT statement (during subsequent loading into the program) to present its characteristic question mark—or series of them—on the monitor's screen before file information transfers from tape to memory.

After the tape recorder has

begun rolling, line 1675 calls the relatively short (70 loops) subroutine at line 1820 to separate subsequent elements of the list being recorded on the taped file. The duration of both delay loops was determined experimentally. If your system operates at 300 baud, the delay loops shown should be adequate for your use. If you can dump and load faster than 300 baud, you will probably want to adjust the delay loops by changing the values given to "E" in lines 1790 and 1820.

Executing the Program

To test the initial file you have prepared using this editor program, rewind the tape into its cassette, prepare your recorder for "play" (load) and enter "RUN" at your keyboard. When the executor system's option list appears on your monitor's screen, select option 7, "Read Address List From Tape."

As soon as the first block of names has been entered into core memory via INPUT statements, select option 5, "List All Addressees" (line 250). When you ask for a listing of all information in memory, the sequence number, name, street address, city, state, zip code, telephone number and birth date of each addressee will be presented on your video terminal. Note the sequence number that has been assigned to the individual whose data needs correction. It is *that* number you must enter in response to the INPUT statement that results from line 680.

After you have entered the correspondent's sequence number, you will be asked which element of information (name, address, phone number, etc.) you wish to edit. If you respond by typing a number "3" (line 750), the addressee's telephone number in the file will be displayed on your monitor's screen (line 1010) and you will be asked to enter the corrected phone number (lines 1030 to 1050).

The correspondent's sequence number becomes important, too, in the event you want to delete an addressee

```
TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS TO:
1--PREPARE A NEW ADDRESS LIST
2--EDIT INFORMATION IN LIST
3--DELETE AN ADDRESSEE
4--ADD AN ADDRESSEE TO LIST
5--LIST ALL ADDRESSEES
6--COPY LIST IN MEMORY TO TAPE
7--READ ADDRESS LIST FROM TAPE
8--EXIT FROM EDITOR PROGRAM
```

INSTRUCTION ? 4

IF NEXT PERSON TO BE LISTED LIVES WITH LAST ADDRESSEE
ENTERED, TYPE A 'Y'; OTHERWISE HIT 'RETURN' KEY

'Y' OR 'RETURN' ? Y

TYPE NAME USING THIS PATTERN: LAST NAME, FIRST
NAME, MI.(XXXXXX;XXXX X.). PLACE A '*' IMMEDIATELY
AFTER NAME ENTRY IF PERSON IS ON YOUR XMAS CARD LIST

TYPE '9' IF THERE ARE NO MORE NAMES
TO BE ADDED TO YOUR LIST.

NAME ? BAKER; SUSAN L.

TYPE BIRTHDATE. USE MONTH-DAY-YEAR PATTERN:
XX-XX-XX. IF BIRTHDATE IS UNKNOWN, TYPE 00-00-00

BIRTHDATE ? 09-12-77

Sample 4. Example of edit operation to add a name to an existing list. Underlined entries indicate operator responses to program questions.

```
TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS TO:
1--PREPARE A NEW ADDRESS LIST
2--EDIT INFORMATION IN LIST
3--DELETE AN ADDRESSEE
4--ADD AN ADDRESSEE TO LIST
5--LIST ALL ADDRESSEES
6--COPY LIST IN MEMORY TO TAPE
7--READ ADDRESS LIST FROM TAPE
8--EXIT FROM EDITOR PROGRAM
```

INSTRUCTION ? 5

1 ABLE;FRANK R.*	123 RANDOLPH RD.
ATLANTA;GA.33333	400/555-5555
03-23-45	
2 ABLE; RUTH C.*	123 RANDOLPH RD.
ATLANTA;GA.33333	400/555-5555
12-22-46	
3 ABLE; BILLY	123 RANDOLPH RD.
ATLANTA;GA.33333	400/555-5555
07-06-69	
4 BAKER; CARL F.	PO BOX 123
BALTIMORE;MD.21111	300/444-4444
00-00-00	

TO CONTINUE, PRESS 'RETURN' KEY
?

5 BAKER; MILDRED	PO BOX 123
BALTIMORE;MD.21111	300/444-4444
09-27-55	
6 DELETED	

7 BAKER; SUSAN L.

09-12-77

--END OF LIST--PRESS 'RETURN' KEY
?

Sample 5. Example of the use of Option 5, "List All Addressees."

from your file (line 1170). To be certain that you delete only the intended information, the name and other data identified by the sequence number you selected will appear on the CRT's

screen (lines 1210 to 1230).

If the name that appears is the one you intended to delete, enter a "1" at your keyboard. If you made a mistake in typing the wrong addressee sequence

number or if you merely changed your mind after deletion, type a "2" (line 1280) and re-identify the name you intend to remove from your file.

Lines 1320, 1330 and 1660 perform the file deletion operation. Line 1660 causes names you wish eliminated to be bypassed by the "dump" routine. Refer to line 130 for the L\$= "Deleted" definition.

After information associated with the first four names has been presented on your monitor's screen, the program pauses to give you time to examine the displayed data. When you are ready to continue, press the "Return" or "Enter" key at your terminal, and the next four names will appear. The four-name counter appears in lines 1510 and 1550. If you wish to present fewer or more names, change line 1550 accordingly.

If Troubles Develop ...

If your cassette tape file input ever misfires or if your modified program develops a fault that causes the editor program to jump back to BASIC, you may receive a message (line 1470), "The address list in memory contains no names," when you ask for a listing of all addressees (line 250). If the fault (error) message you receive requires you to reenter a corrected program statement, you may lose access to the block of names you had previously loaded into memory. That's no big loss if you are revising or checking a file. You can rewind the taped list and reload it. Before reloading the block of names, however, try typing "GOTO 190" and select option 5, "List All Addressees," to determine whether or not the block of names has been erased. It might still be there.

A Beginner's Program

Any professional programmer who reads this article will recognize that no part of the editor program can be classified as "sophisticated." It wasn't meant to be more than useful. The program was written for the novice, hobby programmer who wants to be able

to follow a set of computer instructions from beginning to end almost as easily as his computer traces its path through the program.

If the novice makes mistakes in attempting to tailor this program to fit his own system's requirements, he need not worry. Errors should not be difficult to spot and eliminate since the runs shown in Samples 1 to 5 illustrate how the presentation should appear.

In writing program instructions to assist the novice to prepare and edit information in his address list, we have taken pains to guide his every entry. Perhaps we've overdone it—particularly in lines 360 to 400. For a machine running at 300 baud or less, waiting for the

name INPUT question mark can seem like an eternity. Once the operator becomes familiar with the program—particularly with the required format of entries—the instruction wording can be reduced to cut the "dead" time during preparation of the original address list file.

Because the editor program is quite long, we have eliminated the usual "careless operator" safeguards. If, for example, you respond to line 290 with a number above eight, the program will jump back to BASIC and produce an error message. Or, if you use a comma between surnames and given names (instead of using a semicolon), no warning statement will be flashed on the screen suggesting that the cor-

rect punctuation be used.

If such reminders are wanted—and memory capacity is available to accommodate them—they can be introduced by the programmer.

We think that the novice programmer will find that the editor and address list programs work well together. Admittedly, at 300 baud (the Kansas City cassette recorder speed standard), the loading of information into memory is slow. But the search that follows entry of the data is fast.

There is one positive thing that you can say for creating computer-controlled files by recording data on tape in serial (one character at a time) form: It makes you yearn to get your hands on a floppy disk. ■

Program listing.

```
0010 REM ADDRESS EDITOR PROGRAM
0020 REM PREPARED BY B. BATEMAN AND S. WANTZ
0030 REM PROGRAM LENGTH: 6.5K BYTES
0040 REM PROGRAM RUNS IN SWTPC 8K BASIC VERSION 2.0
0050 PRINT CHR$(16),CHR$(22):PRINT:PRINT
0100 PRINT TAB(10);"ADDRESS EDITOR PROGRAM"
0110 LINE= 0
0120 I=0:US="9"
0130 L$="DELETED": PRINT:PRINT
0140 PRINT "TYPE THE NUMBER OF NAMES YOU WANT TO READ"
0150 PRINT "FROM TAPE--OR RECORD ON TAPE--AT ONE TIME."
0160 PRINT : INPUT "HOW MANY NAMES ",R
0170 R1=R+INT(0.2*R)+2
0180 DIM NS(R1),A$(R1),C$(R1),P$(R1),B$(R1)
0190 PRINT :PRINT CHR$(16),CHR$(22):A=0
0200 PRINT "TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS TO:"
0210 PRINT TAB(10);"1--PREPARE A NEW ADDRESS LIST"
0220 PRINT TAB(10);"2--EDIT INFORMATION IN LIST"
0230 PRINT TAB(10);"3--DELETE AN ADDRESSEE"
0240 PRINT TAB(10);"4--ADD AN ADDRESSEE TO LIST"
0250 PRINT TAB(10);"5--LIST ALL ADDRESSEES"
0260 PRINT TAB(10);"6--COPY LIST IN MEMORY TO TAPE"
0270 PRINT TAB(10);"7--READ ADDRESS LIST FROM TAPE"
0280 PRINT TAB(10);"8--EXIT FROM EDITOR PROGRAM"
0290 PRINT :INPUT "INSTRUCTION ",T
0300 ON T GOTO 310,660,1160,1360,1450,1600,1850,9999
0310 FOR I=1 TO R: IF I=1 THEN 360
0320 PRINT :PRINT CHR$(16),CHR$(22)
0330 PRINT "IF NEXT PERSON TO BE LISTED LIVES WITH LAST ADDRESSEE"
0340 PRINT "ENTERED, TYPE A 'Y'; OTHERWISE HIT 'RETURN' KEY"
0350 PRINT :INPUT "'Y' OR 'RETURN' ",YS
0360 PRINT :PRINT CHR$(16),CHR$(22)
0365 PRINT "TYPE NAME USING THIS PATTERN: LAST NAME, FIRST"
0370 PRINT "NAME, MI.(XXXXXX;XXXX X.). PLACE A '*' IMMEDIATELY"
0375 PRINT "AFTER NAME ENTRY IF PERSON IS ON YOUR XMAS CARD LIST"
0380 PRINT :PRINT "TYPE '9' IF THERE ARE NO MORE NAMES"
0390 PRINT "TO BE ADDED TO YOUR LIST."
0400 PRINT :INPUT "NAME",NS(I)
0410 IF NS(I)=US THEN 190
0420 IF Y$="Y" THEN 580
0425 PRINT :PRINT CHR$(16):CHR$(22)
0430 PRINT "TYPE STREET ADDRESS--PATTERN NOT IMPORTANT"
0440 PRINT :INPUT "STREET ADDRESS ",A$(I)
0450 PRINT :PRINT CHR$(16),CHR$(22)
0460 PRINT "TYPE CITY; STATE AND ZIP CODE"
0470 PRINT "USING THIS PATTERN: XXXXX:XX.XXXXXX"
0480 PRINT :INPUT "CITY;STATE AND ZIP CODE ",C$(I)
0490 PRINT :PRINT CHR$(16),CHR$(22)
0500 PRINT "TYPE PHONE NUMBER--PATTERN NOT IMPORTANT"
0510 PRINT "IF PHONE NUMBER IS NOT KNOWN, HIT 'RETURN' KEY"
0520 PRINT : INPUT "PHONE NUMBER ",P$(I)
0530 PRINT : PRINT CHR$(16),CHR$(22)
0540 PRINT "TYPE BIRTHDATE. USE MONTH-DAY-YEAR PATTERN:"
0550 PRINT "XX-XX-XX. IF BIRTHDATE IS UNKNOWN, TYPE 00-00-00"
0560 PRINT : INPUT "BIRTHDATE ",B$(I)
0565 IF A=1 THEN 190
0570 NEXT I
0575 GOTO 1400
```

```

0580 A$(I)=A$(I-1)
0590 C$(I)=C$(I-1)
0600 P$(I)=P$(I-1)
0610 GOTO 530
0660 PRINT :PRINT CHR$(16),CHR$(22)
0670 PRINT "WHICH ADDRESSEE NUMBER IN YOUR LIST DO YOU WISH TO EDIT?"
0680 PRINT :INPUT "ADDRESSEE LIST NUMBER ",0
0690 PRINT :PRINT CHR$(16):CHR$(22)
0700 PRINT "TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS"
0710 PRINT "TO INDICATE THE ELEMENT YOU WISH TO EDIT"
0720 PRINT :PRINT
0730 PRINT "1--NAME OR XMAS CARD LIST CODE"
0740 PRINT "2--ADDRESS"
0750 PRINT "3--PHONE NUMBER"
0760 PRINT "4--BIRTHDATE"
0770 PRINT "5--END EDIT OPERATION"
0780 PRINT : INPUT "INSTRUCTION NUMBER ",0
0790 ON 0 GOTO 800,890,1000,1080,190
0800 PRINT :PRINT CHR$(16),CHR$(22):PRINT NS(0)
0810 PRINT "TYPE NAME USING PATTERN: XXXXX:XXXXX X.": PRINT
0820 PRINT "IF PERSON NAMED IS ON YOUR XMAS CARD MAILING"
0830 PRINT "LIST, ADD '*' IMMEDIATELY AFTER THE NAME.":PRINT
0840 PRINT : INPUT "NAME ",NS(0)
0850 PRINT :PRINT CHR$(16),CHR$(22)
0860 GOTO 660
0890 PRINT :PRINT CHR$(16):CHR$(22):PRINT A$(0):PRINT
0900 PRINT "TYPE NEW STREET ADDRESS"
0910 PRINT :INPUT "STREET ADDRESS ",A$(0)
0920 PRINT
0930 PRINT C$(0)
0940 PRINT
0950 PRINT "TYPE CITY, STATE, AND ZIP CODE USING"
0960 PRINT "THIS PATTERN: XXXXX:XX:XXXXX":PRINT
0970 PRINT :INPUT "CITY, STATE AND ZIP CODE ",C$(0)
0990 GOTO 660
1000 PRINT :PRINT CHR$(16),CHR$(22)
1010 PRINT P$(0)
1020 PRINT
1030 PRINT "TYPE NEW PHONE NUMBER--PATTERN NOT IMPORTANT":PRINT
1040 PRINT "IF PHONE NUMBER IS UNKNOWN, HIT 'RETURN' KEY":PRINT
1050 PRINT : INPUT "PHONE NUMBER ",P$(0)
1070 GOTO 660
1080 PRINT :PRINT CHR$(16),CHR$(22)
1090 PRINT B$(0)
1100 PRINT
1110 PRINT "TYPE BIRTHDATE. USE MONTH-DAY-YEAR"
1120 PRINT "PATTERN: XX-XX-XX": PRINT
1130 PRINT : INPUT "BIRTHDATE ",B$(0)
1150 GOTO 660
1160 PRINT :PRINT CHR$(16),CHR$(22)
1170 PRINT "TYPE NUMBER ASSIGNED TO ADDRESSEE YOU WISH TO DELETE"
1180 PRINT
1190 PRINT : INPUT "ADDRESSEE NUMBER ",M
1200 PRINT :PRINT CHR$(16),CHR$(22)
1210 PRINT M:TAB(5):NS(M):TAB(35):A$(M)
1220 PRINT TAB(5):C$(M):TAB(35):P$(M)
1230 PRINT TAB(5):B$(M)
1240 PRINT
1250 PRINT "TYPE ONE OF THE FOLLOWING INSTRUCTION NUMBERS:"
1260 PRINT
1270 PRINT TAB(5);":--DELETE ADDRESSEE SHOWN ABOVE"
1280 PRINT TAB(5);"--DELETE DIFFERENT ADDRESSEE"
1290 PRINT TAB(5);":3--RETURN TO MAIN PROGRAM"
1300 PRINT "INSTRUCTION NUMBER"::INPUT V
1310 ON V GOTO 1320,1160,190
1320 NS(M)=L$:A$(M)=L$:C$(M)=L$
1330 P$(M)=L$:B$(M)=L$
1340 PRINT :PRINT CHR$(16),CHR$(22)
1350 GOTO 190
1360 PRINT :PRINT CHR$(16),CHR$(22)
1365 IF NS(I)=U$ THEN GOSUB 2030
1370 A=1:I=I+1

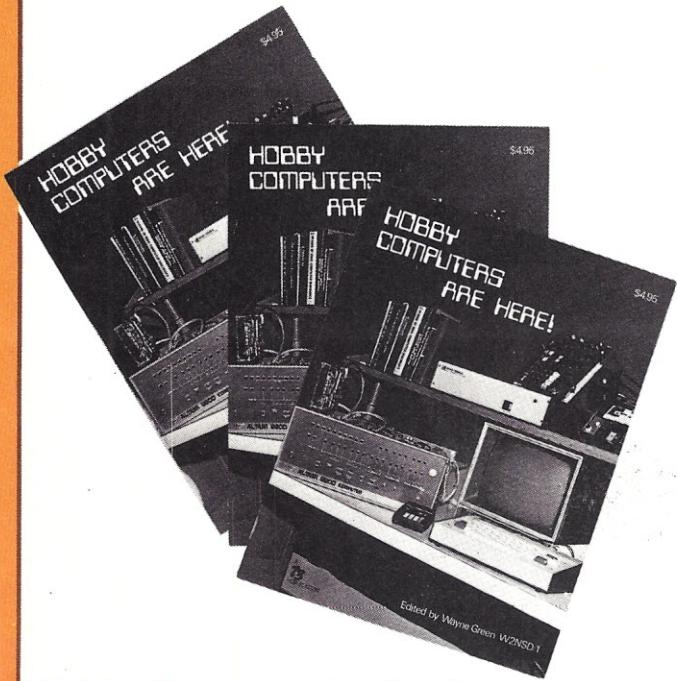
```

```

1380 IF I>R1 THEN I=I-1: GOTO 1400
1390 GOTO 330
1400 PRINT :PRINT CHR$(16),CHR$(22)
1410 PRINT "TIME TO TRANSFER THIS BLOCK OF NAMES"
1420 PRINT "FROM MEMORY TO TAPE BEFORE ADDING ANOTHER NAME"
1430 PRINT :INPUT "TO CONTINUE, PRESS 'RETURN' KEY",H$
1440 GOTO 190
1450 K=0: PRINT CHR$(16):CHR$(22)
1460 IF I<>0 THEN 1500
1470 PRINT "THE ADDRESS LIST IN MEMORY CONTAINS NO NAMES"
1480 PRINT :PRINT "TO CONTINUE, PRESS 'RETURN' KEY":INPUT H$
1490 GOTO 190
1500 FOR J=1 TO I
1510 K=K+1
1520 PRINT J:TAB(5):NS(J):TAB(35):A$(J)
1530 PRINT TAB(5):C$(J):TAB(35):P$(J)
1540 PRINT TAB(5): B$(J)
1550 IF K<4 THEN 1570
1560 K=0:PRINT:PRINT "TO CONTINUE, PRESS 'RETURN' KEY"
1565 INPUT H$: PRINT:PRINT CHR$(16),CHR$(22)
1570 NEXT J
1580 PRINT :PRINT"--END OF LIST--PRESS 'RETURN' KEY":INPUT H$
1590 GOTO 190
1600 PRINT :PRINT CHR$(16),CHR$(22):A1=0
1601 PRINT "IS THIS THE LAST GROUP OF NAMES TO BE"
1602 PRINT "ADDED TO THE LIST--YES OR NO?"
1603 INPUT H$: IF H$="YES" THEN A1=1
1610 PRINT "CHECK BAUD RATE CONTROLS, TAPE AND RECORDER"
1620 PRINT "CONTROLS.":PRINT:PRINT
1630 PRINT "WHEN YOU ARE READY TO RECORD, HIT 'RETURN' KEY"
1640 INPUT H$: PRINT CHR$(18)
1650 FOR J=1 TO I
1660 IF NS(J)=L$ THEN 1780
1670 IF J=1 GOSUB 1790
1675 IF J>1 GOSUB 1820
1680 PRINT NS(J)
1690 GOSUB 1820
1700 PRINT A$(J)
1710 GOSUB 1820
1720 PRINT C$(J)
1730 GOSUB 1820
1740 PRINT P$(J)
1750 GOSUB 1820
1760 PRINT B$(J)
1780 NEXT J
1785 IF A1=1 THEN GOSUB 1790:PRINT US
1786 PRINT CHR$(20):GOTO 190
1790 FOR E=1 TO 500
1800 NEXT E
1810 RETURN
1820 FOR E=1 TO 70
1830 NEXT E
1840 RETURN
1850 PRINT :PRINT CHR$(16),CHR$(22):I=0
1860 PRINT "PREPARE RECORDER FOR PLAYBACK OF ADDRESS LIST TAPE"
1870 PRINT "----SET BAUD RATE SWITCHES---"
1880 PRINT "WHEN ALL IS READY, PRESS 'RETURN' KEY"
1890 INPUT H$
1900 PRINT CHR$(17)
1910 FOR I=1 TO R
1920 PRINT I
1930 INPUT NS(I)
1940 IF NS(I) = US THEN I=I-1:GOTO 2020
1950 INPUT A$(I)
1960 INPUT C$(I)
1970 INPUT P$(I)
1980 INPUT B$(I)
2000 NEXT I
2020 PRINT CHR$(19):GOTO 190
2030 NS(I)=L$
2040 RETURN
9999 END

```

SUBSCRIBE TO KILOBAUD TODAY AND RECEIVE THIS \$5 BOOK FREE!!!



Hobby Computers Are Here!

... is for the beginner. It starts with the fundamentals of microcomputers ... shows how all of the basic parts of a computer system work ... gates, flip-flops, TTL logic, keyboards, video generators, I/O systems, CPUs. It's an entire basic education in microcomputing.

Subscribe to **Kilobaud**, the small computer magazine, this month and take advantage of this great offer. We'll send you one of the best-selling books in the computer field—**Hobby Computers Are Here**.

In addition, if at any time you wish to stop receiving **Kilobaud** for any reason, simply cancel, and we'll send you a full refund for all remaining issues. You keep the book.

However, we're betting that once you look at your first issue of **Kilobaud**, we'll have you for life. Because **Kilobaud** is written for beginners as well as experts, you'll quickly experience the euphoria of Microcomputer Madness—even if you think the S-100 bus is a means of mass transport.

You'll learn how to get started in microcomputing ... what to look for in equipment ... where to get the best programs ... how to improve your home ... make money in microcomputing ... and have more fun using a microcomputer.

You'll find that **Kilobaud** is an ever-expanding encyclopedia of microcomputing that guides you into previously uncharted territory ... gives you the skills that were only science fiction a few years ago ... and leads you through a fascinating world in which your life is more convenient, more exciting and just plain more fun.

And by mailing the card on this page now, you receive the book free and save on your trial subscription, with the understanding that you may cancel at any time, keep the free book, and receive a full refund at once for all remaining issues.

Why not experience the euphoria of Microcomputer Madness, starting with a free book? Mail the postage-paid form today. No need to send money now, we'll worry about that after you decide whether **Kilobaud** is as addictive as we say.

Toll Free Subscription Number (800) 258-5473

kilobaud

peterborough nh 03458

An advanced desktop data system for \$1,995? Quitcherkiddin*, TANO.

We're not kiddin'.

Outpost 11 is exactly that. You get:

- A ruggedly designed unit, intended for heavy use
- Full ASCII keyboard
- 24 x 80 character CRT
- 32K bytes RAM
- M6800 CPU
- Mini-floppy disk drive and controller
- BASIC software package
- Over 20 applications packages available
- User documentation

Just like this, for only



\$1995

COMPLETE

With Outpost 11 and the BASIC software package, you can:

Do full floating point BCD math • Program SAVE and LOAD with file names •

Program MERGE and CHAIN • ON ERROR statement • String variables and functions • Trig and math functions • GET, PUT and FIELD statements • Floppy file processor.

Order Form

You've been waiting a long time for a Data System with all these features at a price like this. Now it's yours. No kiddin'.

*Quit your kidding

Mail to:

TANO

Corporation ✓T37
4521 W. Napoleon Avenue
Metairie, La. 70001

(504) 888-4884
TWX 810-591-5229

Quitcherkiddin', TANO. I'm calling your hand. Send me _____ Outpost 11's as described in your ad. Here's my deposit of \$200 each, plus \$35 freight and insurance. I'll pay the balance on delivery.

Name _____

Company/Title _____

Shipping Address _____

Telephone _____ Signature _____

Charge my: American Express; Visa; Master Charge: # _____

Sales Offices: Los Angeles, CA—213/426-7375 • Montreal, Canada—514/934-0000 • Boston, MA—617/969-4650 • Dallas, TX—214/358-1307 • Houston, TX—713/461-0038 • Denver, Col.—303/841-2788 • San Francisco, CA—408/377-7001 • Chicago, IL—312/830-0060 • Atlanta, GA—404/252-6609 • Washington, DC—301/589-2802 •

Display Your PET!

Watch your CRT as all 316 PET characters appear on the screen.

Believe it or not, the PET 2001 computer has 316 different characters that can be displayed on the screen. Any one of these characters can be displayed at any one of 1000 positions on the screen (25 rows and 40 positions per row).

Each display position has its own unique memory address. In decimal notation these addresses run from 32768 to 33767. Each character is represented by a different combination of bits stored at the particular memory position chosen.

The POKE statement can be used to store a particular bit

```
10 FOR A = 32768 TO 33767
20 POKE A, 32
30 NEXT A
40 B = 32768
50 C = 0
60 FOR A = 0 TO 255
70 C = C + 1
80 POKE B + 2 * A, A
90 IF C = 20 THEN C = 0: B = B + 40
100 NEXT A
110 POKE 59468, 14
120 FOR A = 1 TO 1000
130 NEXT A
140 POKE 59468, 12
150 FOR A = 1 TO 1000
160 NEXT A
170 GOTO 110
```

Program listing.

combination at any desired memory location. For example, to store an A in the middle of the screen, key in POKE 33268,1, which stores binary 00000001 at the memory position with decimal address 33268. Try another example: POKE 33038, 38, which stores decimal 38 (binary 00100110) at decimal address 33038. This displays "&" above and to the right of the middle of the screen.

One byte (8 bits) can only give 256 different combinations, leading one to believe that we have only 256 different characters available. We can

change 60 of the characters by storing either one of two numbers at the memory position with decimal address 59468. POKE 59468,12 gives the normal characters (those shown on the keyboard), and POKE 59468,14 changes 60 of the characters to new characters, including the 26 lowercase letters.

This simple program gives a good demonstration of these ideas. It first blanks out all 1000 display positions and then displays 256 characters. It then changes 60 of these characters back and forth every second or two. ■

PET and TRS-80 :

Just LOAD and GO! Software
Pre-recorded Business Programs
USEFUL-PRACTICAL-LOW-COST!
NO PROGRAMMING EXPERIENCE REQUIRED!

- GENERAL LEDGER—For home businesses, sole proprietorships, small corporations—\$19.95 plus \$1.50 s&h, requires 8K min. user memory
- CHECKING ACCOUNT—For personal bank accounts—\$19.95 plus \$1.50 s&h, requires 8K min. user memory
- RENT ACCOUNTS—Records on rental properties—\$16.95 plus \$1.50 s&h
- LEGAL DIARY—For Attorneys (Client Accounts) \$16.95 plus \$1.50 s&h
- TRUST ACCOUNTS—For Attorneys (Client Accounts) \$16.95 plus \$1.50 s&h

Programs include 2 PerCom "Pilon-30" record cassettes—money back guarantee

HUSTLER Series 1 for PET(tm) are now available in Britain and Europe through:

PETSOFT
PO Box 9, Newbury Berks. RG13 1PB, England

Specify which computer is used.

All mail orders must be pre-paid.

Dealer
Inquiries
Invited

COMPUTERS ONE ✓ C81
#306 Kahala Office Tower
4211 Waialae Ave.
Honolulu, HI 96816
(808)737-2933

COMPUTER CANOPY DUST COVERS

- Attractive, heavy upholstery vinyl
- Ideal for the home or office
- Protects against dust, dirt, spills
- Choice of textured Walnut or Tan

Cover for
APPLE II
\$14.95

POSTPAID
IN U.S.A.
Add \$1 for
C.O.D.
Delivery:
Stock to 3 Weeks



Covers for
PET, ADM-3,
H-9
\$19.95

VISA
M/C, M/O
Allow 3 weeks
for checks.
TX residents add 5% tax



Digital Dynamics, Inc.
Dept. K
Post Office Box 27243
San Antonio, TX 78227
✓ D37

New Jersey's largest computer store.

- Data General Micro-Novas™
- Apple Computers and optional accessories
- RCA VIP
- Business Application Software and Timesharing Services
- Printers
- Applications software for Apple, Radio Shack, Pet
- Beginner programming classes in Extended Basic

**tupetronic
computer
store**

✓ T49

806 Route 17
Ramsey, New Jersey 07446
(Turn in at Hobby House Sign)
Hours: Monday-Saturday, 10-6; Tuesday 10-9
(201) 825-1300

TRS-80 Tape Controller

Life holds enough hassles without your having to constantly connect and disconnect recorder plugs. Build this piece of equipment and you can leave 'em permanently plugged in.

After using my Radio Shack TRS-80 microcomputer system for a while, I became tired of connecting and disconnecting the plugs to the tape recorder every time I used it. If I wanted to rewind or fast-forward the cassette, I had to disconnect the REMOTE plug. The instructions for using the tape recorder with the TRS-80 computer direct the operator to disconnect the plug not being used when either reading or writing tape.

Therefore, to write from the computer to the recorder I had to connect the AUX plug and disconnect the EAR plug; to read from the recorder to the computer I had to connect the EAR plug and disconnect the

AUX plug. This can lead to confusion as to which plug is which, and more than once I lost some data because of this. So I decided to do something about it.

I no longer have to connect or disconnect plugs when I use the recorder with the TRS-80—a black box I built handles all that for me. All I have to do now is set switches. This saves time and frustration and cuts down on errors. I call this black box the TRS-80 Tape Controller.

Components

All components for the black box can be obtained from any Radio Shack store. Of course, they can be obtained elsewhere, but a nearby Radio

Shack store is a convenient source for the components. Besides, it seems appropriate to build an attachment for a TRS-80 computer with Radio Shack parts.

If you want to put together a TRS-80 Tape Controller you don't need any special skills (I frequently solder one finger to another). You just need a sharp knife; a drill; drill bits of 1/2, 3/8, 9/32, 1/4, 5/32 and 1/8 inches; a soldering iron; a pair of long-nose pliers; and something to check circuit continuity. A wire stripper, a pair of diagonal cutters and a spare 1/8 inch miniature phone plug are helpful, but not necessary.

The components needed are shown in Fig. 1. The only other

things needed are solder and some 22-gauge stranded wire (and rub-on letters and some transparent tape if you want to do a pretty lettering job on the box—or use the labels provided if convenient).

Remote-Control Circuit Assembly

Start by taking the cover off the metal cabinet and putting it, along with the screws and washers, where it won't get lost. Next, using a ruler, carefully locate the centers for the holes to be drilled in the front and back of the bottom part of the cabinet (see Fig. 2). Now carefully drill the right-sized holes (as indicated in Fig. 2) at each of the centers and deburr the holes.

Mount the double-pole, double-throw (center off) toggle switch (called the toggle switch from now on) in the 1/2 inch hole and the single-pole, single-throw (normally open) miniature momentary push-button switch (called the momentary switch from now on) in the 9/32 inch hole on the front of the cabinet. Mount the two-conductor 3/32 inch subminiature phone jack (normally closed) in the top middle 5/32 inch hole in the back of the cabinet. Tighten their mounting nuts just enough to keep them from falling out; you'll tighten them later after all the wires are connected to them.

Cut the six foot, 1/8 inch min-



TRS-80 Tape Controller with a standard Radio Shack TRS-80 microcomputer system. (Photos by Marian Early)

Quantity Needed	Component Number on Schematic	Description	Radio Shack Part Number (# in () is minimum sold)
1	--	Metal cabinet, 3 1/4" x 2 3/16" x 4"	270-251 (1)
1	--	Hexagon instrumentation knob with white line mark for 1/4" shaft, 1 3/8" wide by 5/8" deep	274-407 (2)
1	P1	2-conductor 3/32" sub-miniature phone plug (black)	274-289 (2)
1	P2 and P3	72" cord, 1/8" miniature phone plug to 1/8" miniature phone plug	42-2420 (1)
1	J1	2-conductor 3/32" sub-miniature phone jack, closed circuit	274-292 (2)
2	J2 and J3	Enclosed 1/8" miniature phone jacks, closed circuit (open circuit will also work here)	274-296 or 274-297 (2)
1	S1	Toggle switch, heavy-duty DPDT with neutral center red handle	275-653 (1)
1	S2	Push-button switch, SPST miniature momentary contact, normally open	275-1547 (5)
1	S3	Rotary switch, 4-pole, 2-position, 2" shaft 1/4" diameter	275-1384 (1)

Fig. 1. Components needed to build the TRS-80 Tape Controller.

ature phone plug to 1/8 inch miniature phone plug cord into three two-foot pieces. This gives you two pieces of cord each with a phone plug on one end and one piece with nothing on either end. Use a sharp knife to cut around the outer jacket 1/2 inch back from all the cut ends of the cords and remove the outer jacket insulation. Carefully peel back the copper shielding around the center wire insulation and twist the shielding into a lead on each of the cut ends of the cords. Remove about 1/4 inch of insulation from the center wire of the cut ends of the cords. This gives you two leads on each cut end of the cords to solder to the components as required later.

Run one end of the center piece of cord whose ends you prepared through the bottom middle 5/32 inch hole in the back of the cabinet (it should be a tight fit). Now, using 22-gauge stranded wire, connect and solder all connections indicated in the schematic in Fig. 3.

Check out the circuits using your device to check continuity of circuits. If the toggle switch is set to control the computer but there is no plug in the jack, the two ends of the cord out the back of the cabinet should

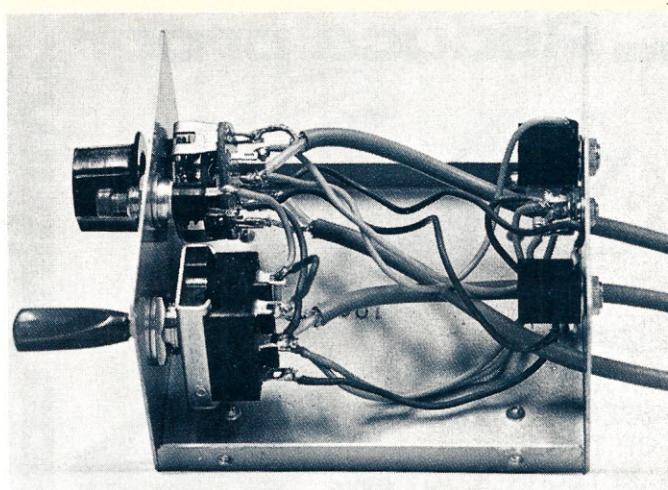
complete a circuit. When the toggle switch is set to off, the circuit should be open with or without a plug in the jack. The circuit should be closed when the toggle switch is in any position and the momentary switch is pushed.

Set the toggle switch so that the computer controls the recorder. With the plug in the jack, the circuit should be open. Now short the connections on the plug and the circuit should be closed.

Set the toggle switch on manual control and the circuit should be closed. If it is, and if all these tests worked as described, the remote-control circuits are finished. If any of the tests failed, check your wiring against the schematic in Fig. 3, correct the error(s) and try the tests again.

Take the body of the 3/32 inch subminiature plug and slide it on the cord from the back of the cabinet so it can be screwed on the plug when it's soldered to the cord. Solder the 3/32 inch subminiature plug on the end of the cord and perform your circuit tests again to be sure there are no shorts.

If it all checks out, tighten the tabs from the plug around the cord and screw the body of the



Close-up of the insides of the TRS-80 Tape Controller.

the plug onto the plug. Now tighten all the mounting nuts holding the switches and the jack to the cabinet. You might want to check your circuits again to be sure nothing happened when you tightened everything up.

quick rewind), press the momentary switch and the recorder is controlled by its keys as long as the momentary switch is pressed.

Read-and-Write Circuit Assembly

Now you are ready to wire up the read and write circuits. First, cut the shaft of the four-pole, two-position rotary switch (called the rotary switch from now on) to about 1/2 inch from the end of the mounting sleeve. Insert the two cut ends of the cords with the 1/8 inch miniature plugs on them in the two bottom 5/32 inch holes on the back of the cabinet (the fit should be tight). Mount the en-

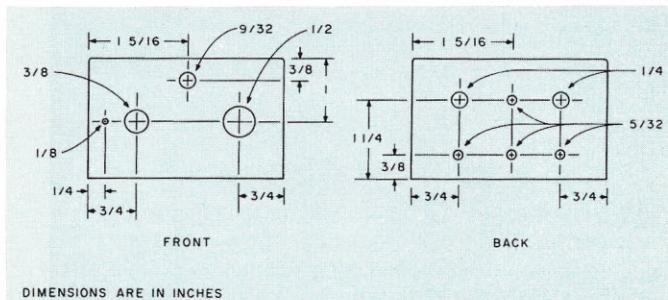


Fig. 2. Front and back of the cabinet showing the centers and the size of the holes to drill for mounting the components.

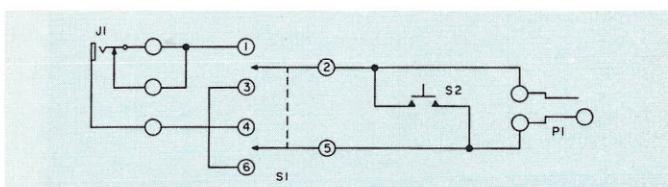


Fig. 3. Schematic of the remote control circuit (the terminal numbers on S1 refer to the terminal numbers on the Radio Shack DPDT center-off toggle switch).

Reduce programming costs



DATA1-K RESIDENT ASSEMBLER/EDITOR FOR THE MOS TECHNOLOGY 6502

The DATA1-K resident assembler/editor is the new, efficient approach to the assembly of microcomputer programs. All assembler/editor functions are performed entirely within memory. In most cases there is no need for a special computer system! Program with the DATA1-K on the system which will ultimately make use of the object code. This not only lowers the initial cost of a development system but greatly decreases the amount of time spent on program debugging.

The DATA1-K assembles fast—over 600 lines per minute—and uses the standard MOS Technology Assembler Language. The DATA1-K features a truly general purpose line oriented text editor with error correction and paged output capability. The DATA1-K is currently in use by: General Electric, Western Electric, Eaton, Monitor Systems, the University of Cincinnati, and many others.

It is presently available on KIM-1 format paper tape or cassette and it includes one year warranty and update.

Price: \$250.00

Available from Johnson Computer, P.O. Box 523, Medina, OH 44256. Phone: (216) 725-4560. Terms: Payment with order/add \$2.00 shipping and handling/add \$10.00 for cassette version. Delivery: stock to 30 days.

ALSO AVAILABLE IN CASSETTE

JOHNSON COMPUTER
P. O. BOX 523 MEDINA, OHIO 44256 ✓J4

Some things are just naturally right.

tiny-c

tiny-c is a structured programming language designed to allow you to focus attention on the problem you want to solve — rather than the language you're using to solve it. With tiny-c you can expand your horizons far beyond the limits of BASIC. The tiny-c Owner's

Manual (including 8080

and PDP-11 source code) is \$40.

Machine readable copies of the interpreter are available on selected media.

To order your tiny-c call or write:

tiny-c associates, P.O. Box 269 Holmdel,

N.J. 07733. (201) 671-2296.

You'll quickly discover tiny-c is naturally right for your language needs.

tiny
C

New Jersey residents include 5% sales tax. Visa and Master Charge accepted. Include charge plus number with order.



Close-up of the front of the TRS-80 Tape Controller showing the labels.

closed 1/8 inch miniature phone jacks in the two top 1/4 inch holes in the back of the cabinet. Tighten the nuts on them just enough to keep them from falling out.

Now you are ready to connect (using 22-gauge stranded wire) and solder the connections as indicated in the schematic in Fig. 4. When you connect the leads from the cords into the back of the cabinet be sure that the circuit from the top jack goes to the cord immediately under it. This keeps the plugs and jacks in the back of the cabinet symmetrical and saves having to remember which plug goes to which jack.

Check out the circuits (a spare 1/8 inch miniature plug will be handy here). Set the rotary switch to one position (you can decide later which you want to be the *read* and which the *write* position) and perform the following tests.

Check to see if the tip of the plug closes the circuit to the tip of the plug inserted in the jack

above it. If the circuit is not closed, then do the same test on the other jack and plug. That circuit should be closed.

If the circuit is closed, check the upper part of the plug above the tip (on the other side of the insulator) to see if it closes the circuit to the corresponding portion of the plug inserted into the jack. If it does, then test that plug and jack against the other plug and jack to be sure the circuits are open between them and there are no short circuits.

Set the rotary switch at its other position and perform the same tests. The opposite plug and jack should have a closed set of circuits; the first plug and jack should have an open set of circuits. If any of the circuits do not check out, check your connections against the schematic in Fig. 4 and correct the error(s).

When the circuits all check out mount the rotary switch in the 3/8 inch hole in the front of the cabinet (make sure the little metal tab projecting from the

**Computer
Manual
Off
Read
Write
Momentary
Manual
TRS-80 Tape Controller**

TRS-80 Tape Controller labels (can be used in lieu of rub-ons).

front of the rotary switch goes into the 1/8 inch hole). Put the mounting nut over the rotary switch shaft and tighten it and the other mounting nuts on the jacks. Mount the knob on the shaft of the rotary switch and tighten the set screw when you have lined up the white indicator line where you want it.

Pick which set of plugs and jacks you want for read and which for write and indicate your choices on the back of the cabinet and on the front at the indicator on the knob. Put the top of the cabinet back on and screw it in place with the screws and washers you put away earlier. You now have a black box that is your TRS-80 Tape Controller.

Connect the tape controller between your TRS-80 computer and tape recorder by connecting the plugs from the com-

momentary switch).

Final Touches

If you want fancy lettering on your tape controller, get some small rub-on letters (most business supply and stationery stores carry a selection of them). Select the sizes that will fit neatly on your tape controller without taking up too much space, but yet, will be easy to read.

Get a clean piece of glass and carefully pull out a long piece of transparent tape and put it, sticky side down, on the glass. Be careful not to get any fingerprints on the sticky surface of the tape.

Using a ball-point pen, carefully rub the letters onto the tape to spell out the labels you need. When the labels are done, press a second piece of tape (sticky side down) over

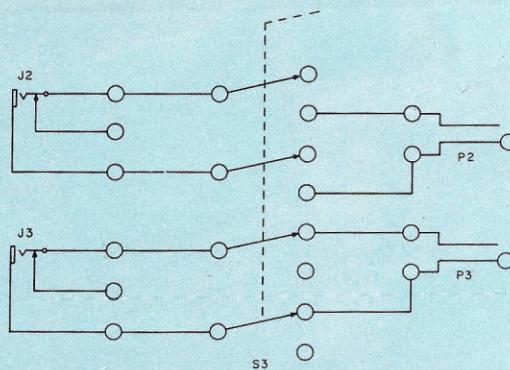


Fig. 4. Schematic of the read and write circuits.

puter to the appropriate jacks in the back of the tape controller and the plugs out the back of the tape controller to the appropriate jacks on the tape recorder.

When you want the computer to write to tape, set the rotary switch to write and the toggle switch to allow the recorder to be controlled by the computer. When you want to read from tape to the computer, set the rotary switch to read and the toggle switch to allow the computer to control the recorder. Use the toggle switch or the momentary switch to control the recorder by its keys. Use the center off position of the toggle switch to shut off all control of the tape recorder (except by the

them. Use a sharp knife and a straightedge to cut around the edges of the labels and remove the excess tape.

Pick up each label with the point of a sharp knife and position it lightly where you want it on the cabinet. Move the label around until it is positioned exactly where you want it and then press down hard on it. It will now stay in that position.

When you're done, you will have a professional looking piece of equipment. It will look at home sitting next to your TRS-80 microcomputer system, and it will serve a useful function by allowing you to control the tape recorder easily without connecting and disconnecting plugs. ■

We sell computers that make sense.



Data General microNOVA™

The Computer Store and its Affiliated Dealers feature the powerful microNOVA™ computer for commercial applications.

We can solve your data processing problems at a surprisingly affordable price!

Comprehensive Applications Software / In Stock-Available Now. Put It to Work for You.

See the microNOVA™:

theComputerStore™

120 Cambridge St. Burlington, MA (617) 272-8770

CONNECTICUT

Hartford/27 Lewis St. (203) 527-9623
Windsor Locks/630 S. Main St. (203) 627-0188

FLORIDA

Tampa Bay/Bradenton/1021 Manatee Ave. West

MASSACHUSETTS (303) 747-8223

Cambridge/1689 Mass. Ave. (617) 354-4599

NEW YORK

Rochester/2423 Monroe Ave. (716) 244-5000

Affiliated Dealers:

COLORADO/Boulder

Automated Information Systems (303) 443-5199

FLORIDA/Orlando

Pelham Data Systems (305) 830-6282

ILLINOIS/Chicago

Compac Systems (Palatine) (312) 359-8566

MARYLAND/Bethesda

ABC Data (301) 986-0552

MISSOURI/St. Louis

Computer Consultants, Inc. (314) 993-5000

NEW HAMPSHIRE/Nashua

Computer Mart (603) 883-2386

NEW JERSEY/Rochelle Park

Micro General (201) 843-0977

TENNESSEE/Memphis

Delta Professional Systems (901) 761-3272

TEXAS/Wichita Falls

The Computer Center (new listing)

AUSTRALIA/New South Wales (Katora)

Sirasch Engineering 430-992

Dealerships * Franchise opportunities available.

SHHH . . . People Are Sleeping

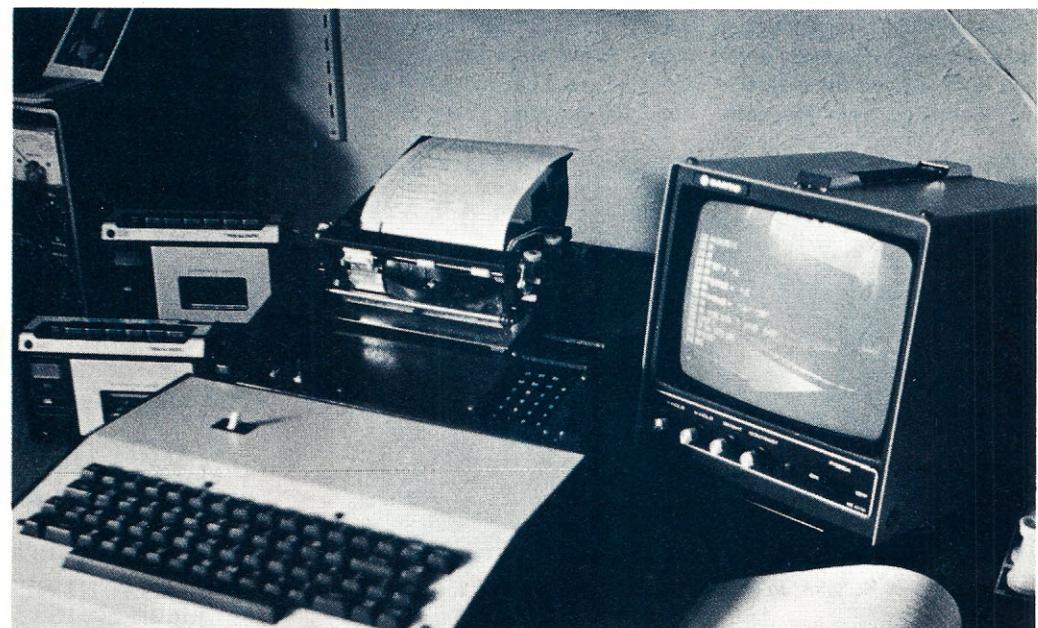
Maybe noisy and expensive Teletype machines turn you off. This thermal printer from Telpar can serve as a quiet (and economical) replacement.

Charles R. Carpenter
Consultant Resources Co.
2228 Montclair Pl.
Carrollton TX 75006

Printing the programs I am writing using my KIM-1 has become quite desirable (at least from my viewpoint). Longer programs have resulted as my skills have increased—growing to over 70 lines in Tiny BASIC and even longer in 6502 assembly language.

Checking widely separated timing loops and counting chains is difficult when you're using only a TV display (very handy for writing and editing though—no waste paper). Writing long programs by hand isn't always practical either. I've committed myself to hobby computing and have some longer-range, work-related interests. At this point I was convinced I needed a printer.

I had been checking printer ads in all the hobby magazines for some time, but the information I found was either conflicting, confusing or otherwise uninformative. I could not tell whether the various printers would work with my KIM-1. The ads either contained nothing about the interface connections or addressed themselves to RS-232C and parallel connections. KIM-1 has a serial, Teletype-oriented interface,



Layout shot of complete system: KIM-1 in redwood enclosure and KIM-2, 4K memory; ACT-1 TTY type TVT with monitor; tape recorders; PS-40 printer; computerist power supply—modified.

and I had no desire to build something that *might* make a printer usable in my system.

Mid June brought the National Computer Conference (and me) to nearby Dallas. While checking out the personal computing exhibits, a display by Telpar, Inc., caught my eye. The Telpar PS-40 printer was being demonstrated, and it was printing with only a keyboard connected to it. (The significance of this did not occur to me until later.)

I picked up the data sheet and went on my way. When I looked at the sheet, I saw that the basic printing speed was

110 baud—Teletype speed. The data also indicated serial input. It seemed to be just what I wanted; now I was at least in-

terested enough to learn more. A couple of days later I called the company and I talked to Rick Ables, vice-president of

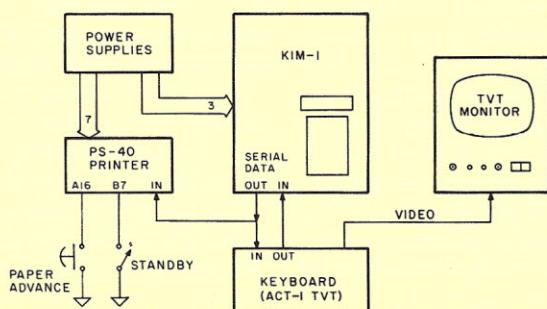


Fig. 1. Serial receive-only block diagram.

Function	Pinnumber	
	To	From
Serial input (active low)	B-6	*KIM-1(A-U)
Serial ground	B-20	KIM-1(A-1)
Standby switch	B-7	B-5
Paper advance (momentary)	A-16	B-5
Jumper	A-5	A-7
Jumper	A-6	A-15
Jumper	A-15	B-15
Jumper	A-8	A-13
+18 V	B-12	Supply
Gnd	B-5	
+16 V	B-23	
Gnd	A-23	
+12 V	A-28	
+5 V	A-21	
Gnd	B-20	Supply

*1k pull-up resistor required from KIM-1 pins (A-U) to (A-S)

Note: Transpose numbers from the numbered pins to the adjacent pins on the lettered side.

Table 1.

engineering. Here's what I learned.

PS-40 Capabilities

Telpar's PS-40-3C-1 can do more than just print. For instance:

- PS-40 can be a complete Teletype replacement.
- Connected for serial receive (the way I use it), it will print whatever valid serial data output it receives from my KIM-1.
- Connected to an ASCII keyboard, the PS-40 can be the sole I/O for most of the popular microcomputers.
- Connected to a KIM-1 command generator, it will print assembly-language programs (uses the KIM-1 keyboard mainly, but makes KIM think it's connected to a Teletype).

More about the PS-40 applications—other than serial receive—later. The system, as I have assembled and am using it, is illustrated in Fig. 1.

Making the Connections

Operating the printer requires connection to a power supply: the serial data output from KIM-1 (requires a pull-up resistor) and some jumpers on the 56-pin edge connector supplied with the printer for the PS-40 circuit board. Make all connections on the 56-pin edge connector first (before you connect it to the printer). After these connections are com-

pleted, check everything carefully (have someone else check it, too, if possible). Then install the edge connector on the PS-40 circuit board. Make sure the numbered side is up. All this caution will eliminate a return trip to Telpar for repairs. The connections to the 56-pin edge connector for serial receive mode at 110 baud are shown in Table 1. Fig. 2 is a pictorial of the pin connections.

Power supplies for the PS-40 can be obtained locally and modified, if needed, to supply the required voltages. Telpar has a supply available (including -12 V if RS-232C con-

nections are used). Those of you having a more adventurous nature may want to build your

own power supply. Schematics (Figs. 3 and 4) of the Telpar power-supply circuits and a suggested power-supply circuit are included for reference.

Be sure your power source can supply peak power for the printer with adequate regulation. During carriage return, the printer motors (18 V) take peak current for more than a second, and during printing, the print head (16 V) hits its peak requirements for each character printed. Power-supply requirements for each output are shown in Table 2.

Print-head voltage is critical and requires close control. It cannot exceed 16 V, but can drop a maximum of 1 V during peak current. Voltages exceeding 16 V are likely to damage the print head. A final word of caution: If the power supply you use won't deliver

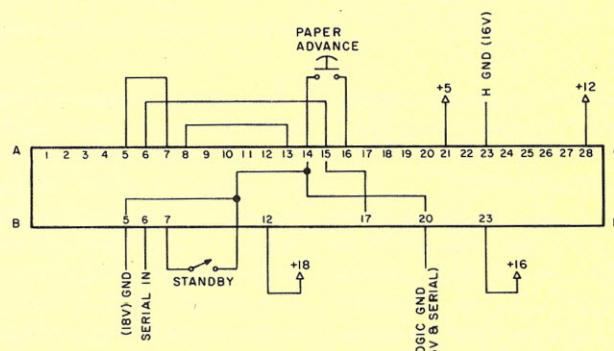


Fig. 2. PS-40 connector, serial receive-input and power connections.

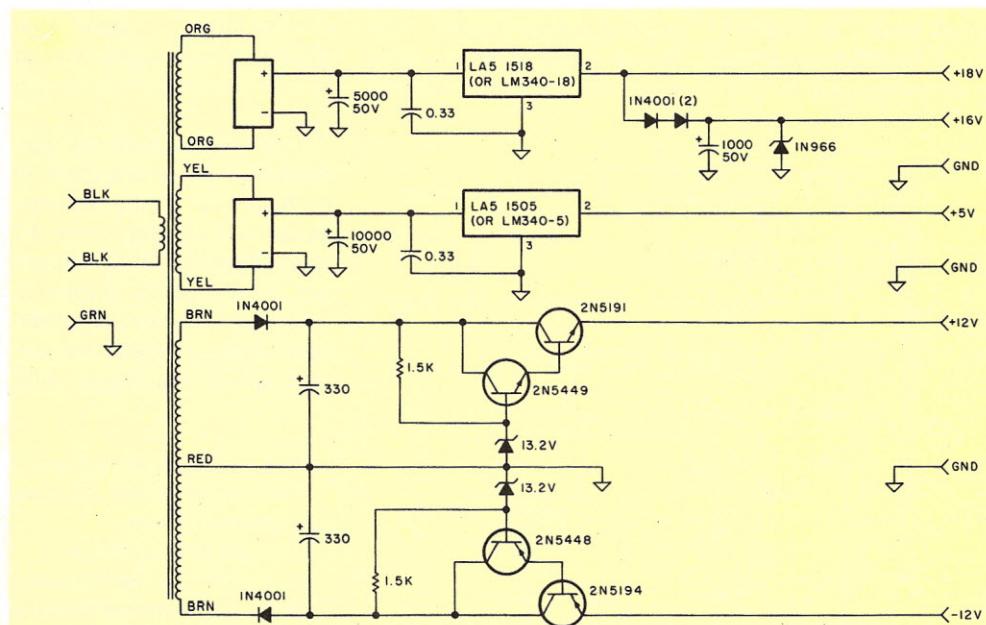
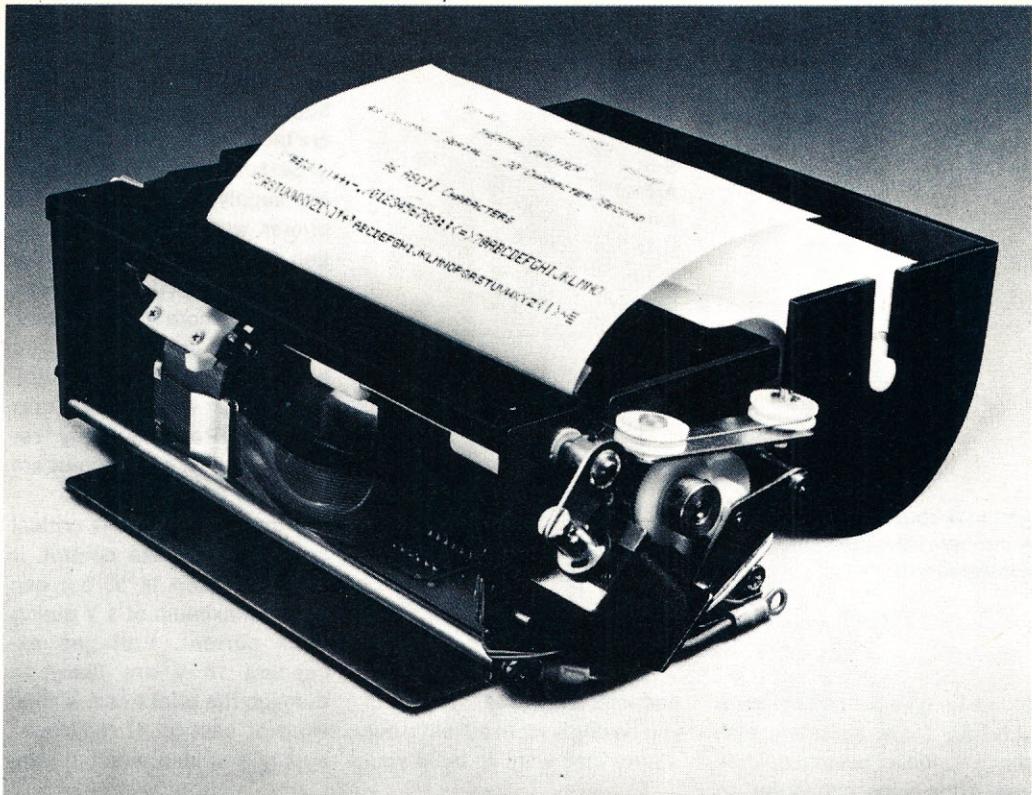


Fig. 3. PS-40 power-supply schematic.



Telpar PS-40 printer and character set.

enough power, the printer probably won't function properly.

Checking Operations

Now that all the connections are made and everything is ready, system and printer operation can be checked. First, turn on your computer and any other system components and verify normal operation. Turn on power to the printer (standby switch at run). A carriage return and line feed are the correct first responses of the printer at power on.

Load a roll of special thermal paper (be sure to order some) into the printer before proceeding further. Printing without paper behind the print head can damage it. There are right and wrong sides of the paper, so be sure to start it right. A diagram on the printer shows the paper feeding into the paper-drive mechanism from the bottom of the roll. Start a trimmed edge of paper into the printer and press the paper-feed switch. Continuous paper advance occurs when this connection is made, allowing paper to feed automatically through the printer. Now make some entries from the keyboard and check printer response. All the characters (and back-space arrow) in Example 1 are possible.

If a framing error (a series of vertical lines) occurs, check the polarity of the output signal. The jumpers are wired for an active low (negative-going) signal. This is the output signal polarity from KIM-1. An active high (positive-going) signal should be connected directly to pin A-7.

If the printer does not run, disconnect power and check all connections. If the standby switch is in standby, or pin B-7 is grounded, the printer will not run. Disconnect the edge connector and measure the unloaded voltages. If these are correct, turn off the supply. After

the supplies have discharged, reconnect the edge connector and make another voltage measurement. Anything out of order means a short circuit or excessive load. Recheck overall system operation again. More than likely some little thing was inadvertently overlooked.

Some other features of the PS-40 can be examined, now that everything is working OK. My TTV keyboard has a capital-letters-lock key, and when I released it, I found the PS-40 would print small caps in a 5×5 dot matrix. (It prints large caps in a 5×7 dot matrix.) The lowercase output emerges as uppercase on my TTV but prints as small caps on the PS-40. Tiny BASIC, my present interpreter, does not recognize the lowercase outputs as commands or statements, but for REM and PRINT commands, any valid data inside the quotes will print. Example 2 shows what I mean. Typing a line longer than 48 characters is no problem either (see Example 3).

As you can see, a form of text editing and word processing is possible with the PS-40. I have used it as a pseudo-typewriter also. A final note on operating the PS-40: It really is quiet. I worked mostly early mornings and late evenings preparing this article, and was able to do all the testing and printing

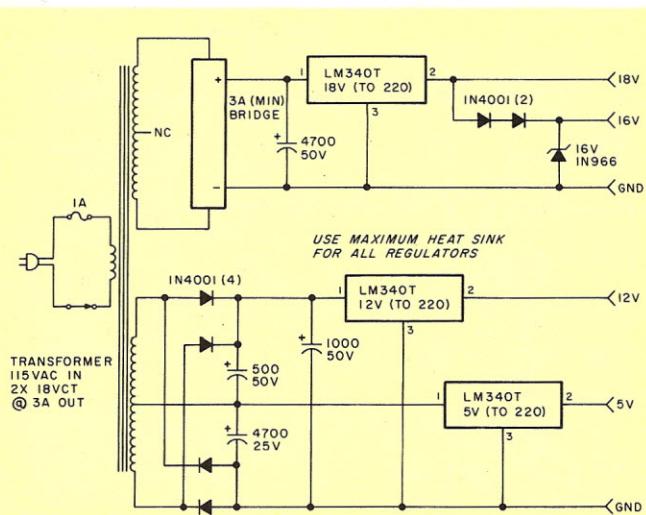


Fig. 4. Suggested power-supply schematic.

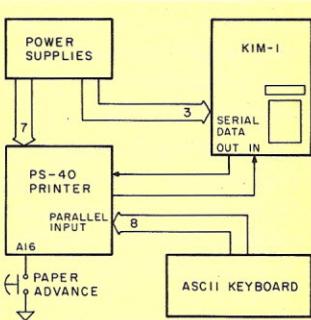


Fig. 5. Teletype replacement block diagram.

+18 V—1.5 Amp max @ less than 50 percent duty cycle.
 +16 V—2.5 Amp peak for $2 \mu\text{s}$ dropping to 1.25 Amp for $6 \mu\text{s}$ @ 35 percent duty cycle.
 +5 V—0.6 Amp continuous.
 +12 V—0.1 Amp continuous.
 -12 V—0.05 Amp continuous (RS-232C only).

Table 2.

Software for the Percom LFD-400

Disk Operating and File Management Systems

INDEX™: The most advanced Disk Operating and File Management System available for the 6800. Interrupt Driven EXecutive operating system features file-and-device-independent, queue-buffered character stream I/O. Linked-File disk architecture, with automatic file creation and allocation for ASCII and binary files, supports sequential and semi-random access disk files. Multilevel file name directory includes name, extension, version, protection, and date. Requires 8K RAM at \$AOOO. Diskette includes numerous utilities. \$99.95

MINIDOS-PLUSX: An easy to use DOS for the small computing system. Supports up to 31 named files. Available on ROM or diskette complete with source listing. \$39.95

Basic Interpreters and Compilers

SUPER BASIC: a 10K extended disk BASIC interpreter for the 6800. Faster than SWTP BASIC, 9-digit accuracy, program CHAINing, BASE 0 subscripting, improved error reporting, disk data files, and print column alignment. Program and data files may be prepared using one of the Text Editors described below \$49.95

BASIC BANDAID™: Turn SWTP 8K BASIC into a respectable random access data file disk BASIC. Includes many speed improvements and program CHAINing. When ordering, specify version (2.0, 2.2, or 2.3). Complete with listing. \$17.95

STRUBAL™: A STRUctured BAsic Language Compiler for the serious professional programmer. Includes elements of BASIC, PL/M, and assembly language. Features 10-digit floating point, strings, scientific functions, and 2-dimensional arrays. Requires 16K RAM memory and LINKING LOADER (see below). Complete with RUN-TIME and FLOATING POINT packages \$99.95

Text Editors

EDIT68: Hemenway Associates powerful disk-based text editor. May be used to create programs and data files. In addition to SEARCH, CHANGE, DELETE, and MOVE functions, EDIT68 supports MACROs which perform complex repetitive editing functions efficiently. Runs in only 6K RAM. "Spooling" permits text files much larger than the available RAM memory to be created and edited. \$29.95

TOUCHUP™: If you already have the TSC Text Editor, TOUCHUP will convert it into a disk-based text editor. ROLL function permits text files much larger than the available RAM memory to be created and edited. TOUCHUP is supplied on diskette complete with source listing. \$17.95

ASSEMBLERS

PERCOM 6800 SYMBOLIC ASSEMBLER: Requires only 8K of RAM memory to assemble programs with 200 labels. More convenient to use than most assemblers; assembly options may be specified at time of assembly. \$29.95

Complete listing of above assembler \$29.95

MACRO-RELOCATING ASSEMBLER: This Hemenway Associates assembler is for the programming professional. Generates relocatable and linkable object code. MACRO facility permits nested macro calls. Permits conditional assembly. Requires 16K RAM \$49.95

LINKING LOADER for STRUBAL and the above assembler \$19.95

Business Applications

GENERAL LEDGER SYSTEM \$199.95

FULL-FUNCTION MAILING LIST \$ 99.95

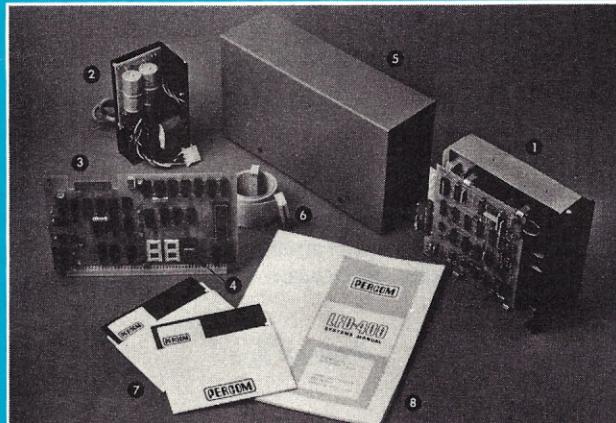
Write or call for our complete software catalog.

PERCOM DATA COMPANY, INC.

Dept K • 318 Barnes • Garland TX 75042

(214) 272-3421

For Your SWTP 6800 Computer...



PERCOM's™ Assembled and Tested FLOPPY DISK SYSTEM the LFD-400

only

\$599.95

shipping paid

**The LFD-400 is ready to plug in and run
the moment you receive it.
Nothing else to buy! Not even extra memory!**

YOU GET:

- 1 The popular Shugart SA 400 minifloppy™ drive. Drive alignment is double checked by PerCom before shipment.
- 2 The drive power supply—fully assembled and tested.
- 3 LFD-400 Controller/Interface—plugs into the SS-50 bus • accommodates three 2708 EPROMs • fully assembled and tested.
- 4 MINIDOS™—the remarkable LFD-400 disk operating system on a 2708 EPROM • plugs into the LFD-400 Controller card • no extra memory required • no "booting" needed.
- 5 Attractive metal enclosure.
- 6 Interconnecting cable—fully assembled and tested.
- 7 Two diskettes—one blank, the other containing numerous software routines including patches for SWTP 8K BASIC and the TSC Editor/Assembler.
- 8 70-page instruction manual—includes operating instructions, schematics, service procedures, and the complete listing of MINIDOS™.
- 9 Technical Memo updates—helpful hints which supplement the manual instructions.
- 10 90-day limited warranty.

Minifloppy is a trademark of Shugart Associates.
MINIDOS is a trademark of PERCOM Data Company, Inc.

The LFD-400 is readily expanded to either two or three drives. Write for details. Send for our free brochure for more information about the LFD-400 Floppy Disk System and LFD-400 software.

To save you money, the LFD-400 Floppy Disk System is available only from PerCom. Because of the special pricing, group and dealer discounts are not available.

MC and VISA welcome. COD orders require 30% deposit plus 5% handling charge. Allow three extra weeks if payment is by personal check. The LFD-400 Floppy Disk System is available immediately. Allow three weeks for testing and transportation. Texas residents add 5% sales tax.

PERCOM™

PERCOM DATA COMPANY, INC.
Dept K 318 BARNES • GARLAND, TX. 75042

(214) 272-3421

PERCOM™ "peripherals for personal computing"

AA BB CC DD EE FF GG HH II JJ KK LL MM
 NN OO PP QQ RR SS TT UU VV WW XX YY ZZ
 1 2 3 4 5 6 7 8 9 0 - ! ~ @ : [] , .
 ! # \$ % & ' () = ~ | + * < > ?
 PS-40 CHARACTER SET

Example 1.

THE PS-40 WILL PRINT LARGE AND SMALL CAPS. THIS IS A VERY HANDY FEATURE FOR USE WITH PRINT AND REM STATEMENTS. HIGHLIGHTING OF KEY WORDS MAKES PROGRAM PROMPTING LINES MORE READABLE.

Example 2.

ANOTHER PS-40 FEATURE - DATA AT THE END OF A LINE IS NOT LOST.

Example 3.

without disturbing anyone (only a few feet away in adjacent rooms). Teletype-like operation with the PS-40 is also possible. Used in this manner, the PS-40 can be the only I/O needed to communicate with a Teletype, serial-data-oriented microcomputer. An ASCII keyboard with seven data bits and a negative-going strobe are also required. Fig. 5 illustrates a system configuration, and Fig. 6 is a connection diagram for the 56-pin edge connector. You may need to provide an inverter for the strobe to make the polarity correct; a spare 7404 IC will do this job nicely. As before, make all the connections to the edge

connector first, then connect it to the printer. When everything's connected and checked out, use the KIM-1 users' manual as a guide for proper Teletype operation.

If printing assembly-language listings and memory dumps is your only requirement, a conceptual KIM-1 command generator circuit may be all that's needed. In Figs. 7 and 8, I have included illustrations of this concept: Fig. 7 shows the block diagram of the system, and Fig. 8 is a concept circuit for the character generator. Remember, this is only a concept. I have done similar things using my ACT-1

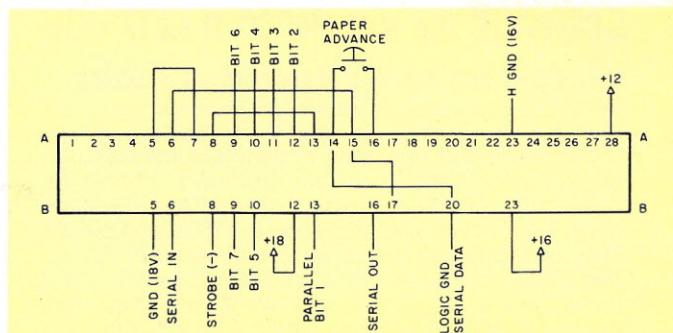


Fig. 6. PS-40 connector, TTY replacement-input and power connections.

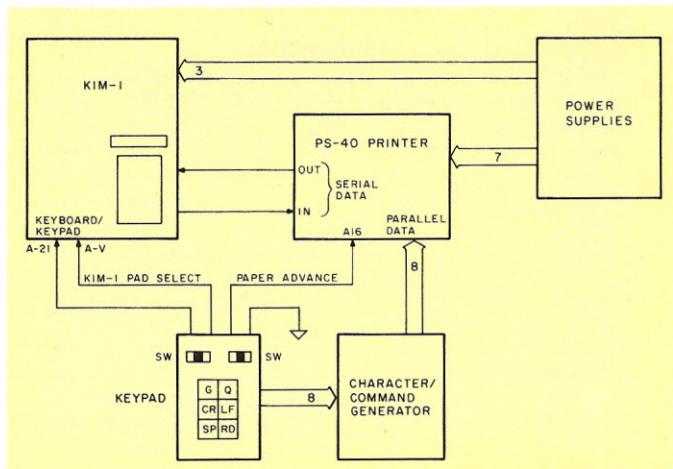


Fig. 7. KIM-1 command generator concept diagram.

TVT, and that's where I got the idea. If you try it and it works, I am sure Kilobaud would like to tell the rest of the world for you.

As a manufacturing engineer, I found the Telpar PS-40 printer well constructed. There are a couple of problem

areas (requires a multiple-output power source; uses special thermal paper), but I consider them minor.

I estimated the cost of building a power supply from Radio Shack parts at \$30 to \$35. A well-stocked junk box reduces the cost much further. A roll of thermal paper from Telpar is no more expensive than one of TTY paper and lasts a long time (I have printed everything in sight and not yet used half a roll). A 48-column, 5½-inch-wide roll is \$3 from Telpar, Inc., 4132A Billy Mitchell Rd, PO Box 796, Addison TX 75001. The PS-40 costs \$4.

Incorporating this printer into my system has been a rewarding experience. The people at Telpar are friendly and pleasant to work with. Rick Ables patiently went over (and over) the operation of the printer and explained all my questions; and Mr. Hanschen, the president of Telpar, made it all possible. Without their help and cooperation, this article might not have been written. ■

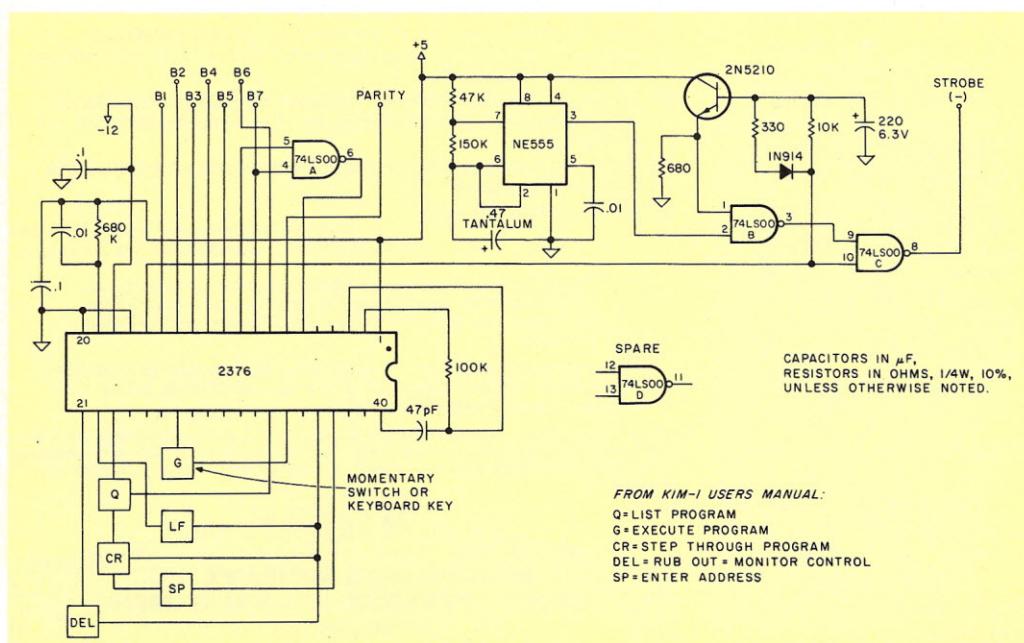


Fig. 8. Command generator schematic.

SELECTRA-TERM™

Mates with TRS-80*
INSTANTLY!



Turn your TRS-80 into a complete word processing system.

Just hook up the cables and connectors supplied with your SELECTRA-TERM and you're ready to run. Input your text and type the single command: LPRINT. The SELECTRA-TERM automatically outputs clear, clean high fidelity copy.

Incredibly simple!

Brand new. \$1925☆
Fully assembled and tested.
Delivery five weeks.
Many options available.
★115 VAC, 60 Hz Model.

Direct international sales inquiries to
International Sales Division
17648 Orna Drive
Granada Hills, CA 91344 USA

Discounts Available to
EDUCATIONAL ACCOUNTS

Contact Dolores Sun
P. O. Box 8394 • Ann Arbor, MI 48105
(313) 665-8514

COMPARE THIS
DOT MATRIX OUTPUT
with the
SELECTRA-TERM high
fidelity impact
print!

SELECTRA-TERM can also be connected to the parallel port of PET • Apple II • Heath H8 • IMSAI • Cromemco • Alpha Microsystems • Space Byte • North Star Horizon • SWTP • Vector Graphic • Sol • Polymorphic • Digital Group • Ohio Scientific • Altair • Sorcerer • Xitan • Rex • KIM • Versatile CRT • EXORcisor

✓ M30

**micro
computer
devices
inc.**



960 E. Orangethorpe, Bldg. F
Anaheim, California 92801
Telephone (714) 992-2270

"Innovators to the Microcomputer Industry"

*TRS-80 is a product of Radio Shack

Philip Tubb
ALF Products, Inc.
128 S. Taft
Denver CO 80228

Say It with a Banner

It's going to be a banner year, and here's the first entry. We'll keep you posted.

Computers have long been used to generate posters. Most computer hobbyists have seen various calendars printed by computers, and (usually in violation of copyright laws) posters of Snoopy, Star Trek characters and, recently, Star Wars characters. Another form of computer poster that has long been popular is the character-string poster, or "banner." The program presented here

(Program A) is an 8080 assembly-language program to print character-string posters. Four sets of data are available to print in different character styles. The most useful character set (in my opinion) is the Franklin Gothic Wide (FGW) data. This data was obtained by a simple brute-force method: The character set was projected using an opaque projector and traced onto paper already

printed up with indications of

piet-a-type spaces.

With great restraint, non-symmetries present in the character set were retained in the final data, resulting in realistic reproductions of the FGW characters. They are bold characters with very heavy lines and are easily read from a distance. They do, however, take a great deal of time to print (especially on ten-character-per-second

terminals).

Another popular character set is Old English. That data was created by Bob Purser by sheer artistic interpretation of Old English characters. As usual in Old English, many characters are not recognizable except by context.

The remaining two character sets are Football Scoreboard and Football Scoreboard Italic, which were my first character sets. They were originally designed for a special poster program that used a different form of data. (An object listing of the

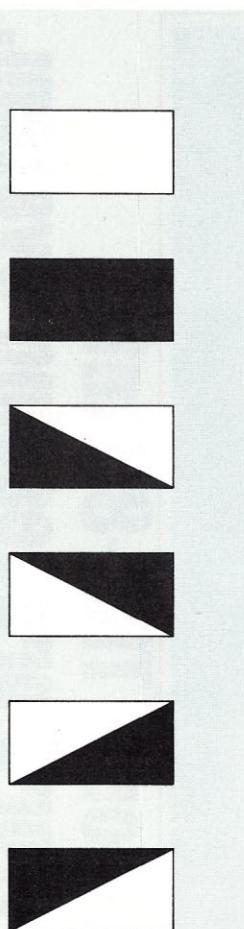
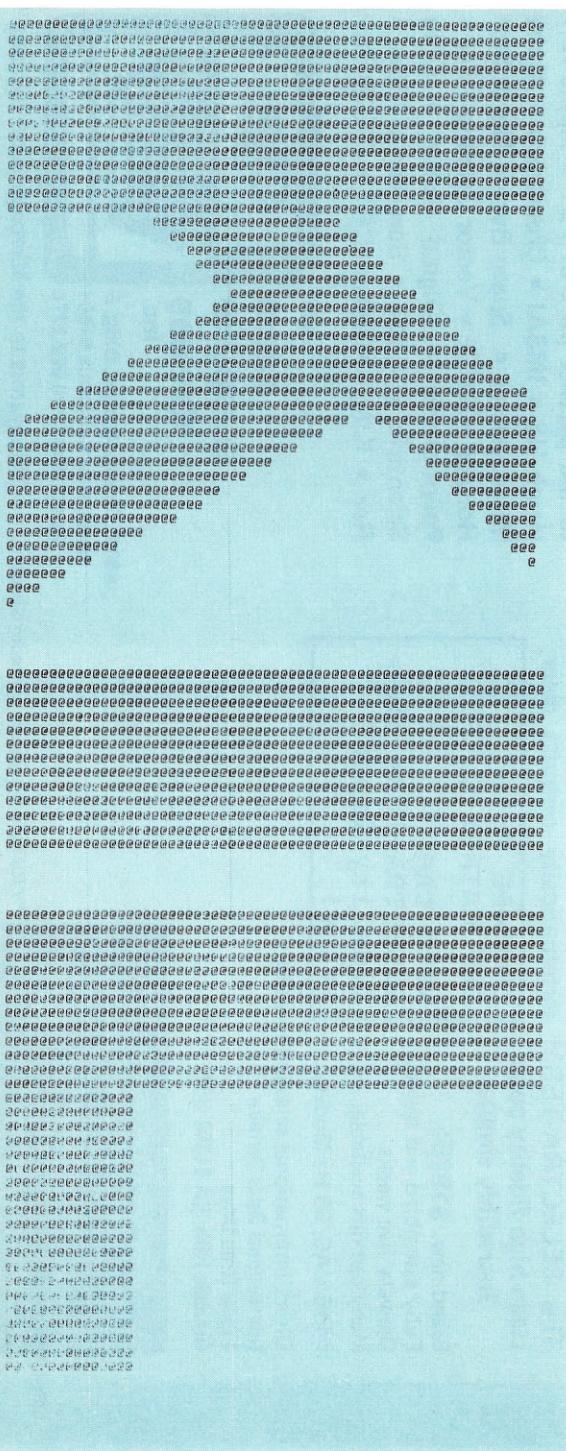
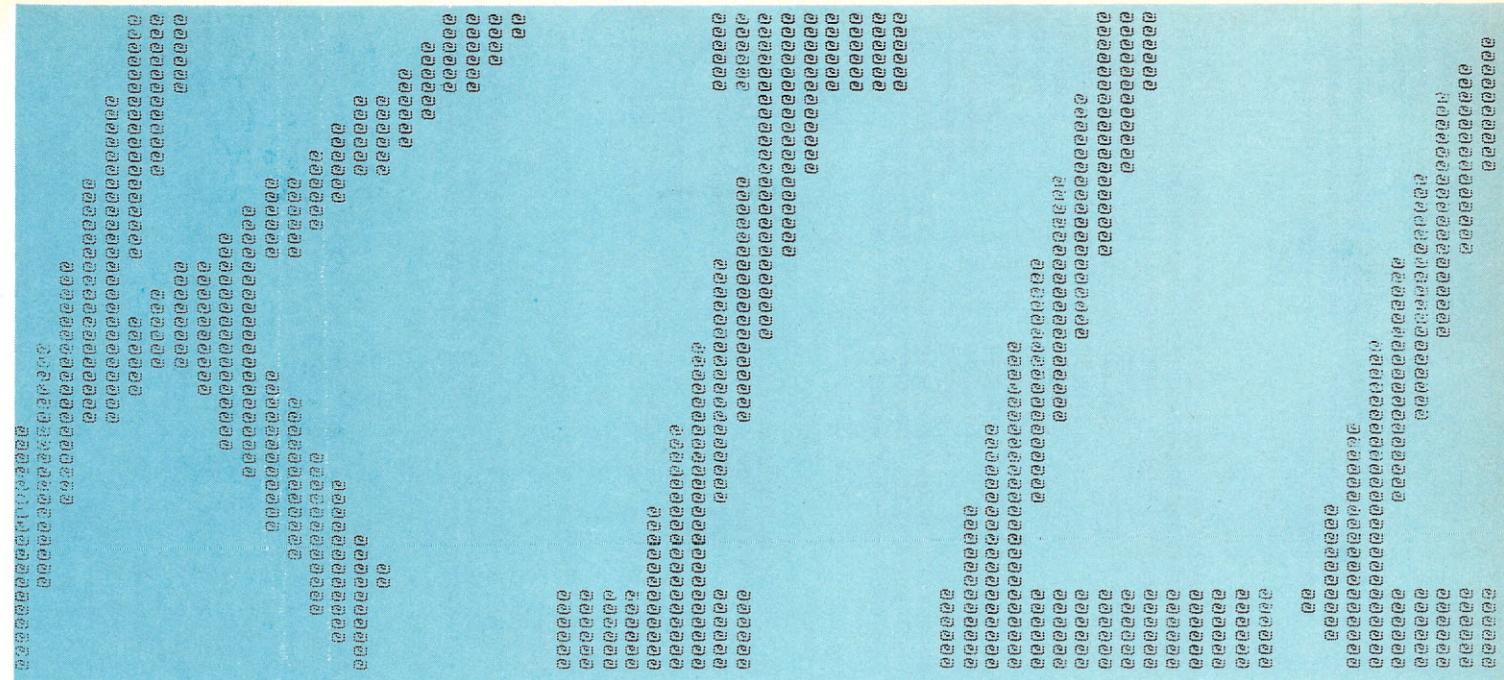


Fig. 1.

Football Scoreboard data is presented in Program B.) The characters consist of an 8 x 8 dot matrix using the six types of dots shown in Fig. 1.

The first inclination in poster programs is to use a standard 5 x 7 or 7 x 9 dot matrix. Although





this is fine for printing very small letters with overlapping dots (as on a CRT or a dot-matrix printer), a first attempt will reveal that it is quite poor for poster printing.

Having seen such attempts, I began by solving the corner and diagonal line problems with my six dot types. Using a chessboard (8 x 8, remember?) and several scraps of paper (blank, filled-in and four diagonally half filled-ins), I designed the characters. Each dot is represented by three lines of characters, five characters wide. The italic version was (quite obviously) created by moving each successive dot down by one line; the result is marginally passable.

All four character sets include the characters A through Z (uppercase) and space. Old English also includes lowercase a through z. Franklin Gothic Wide includes 0 through 9, ?, \$, !, &, ', comma, semicolon, hyphen, period, colon, and both opening and closing quotes. (The quotes are given in ASCII as open and closed square brackets.) The Football Scoreboard sets include 1 through 9, period, comma, semicolon, ?, !, colon, ", ', (,) and -.

Now for a look at the program. Line 200 sets the stack pointer; this may have to be changed if you don't have RAM at the very highest addresses. The program begins with a

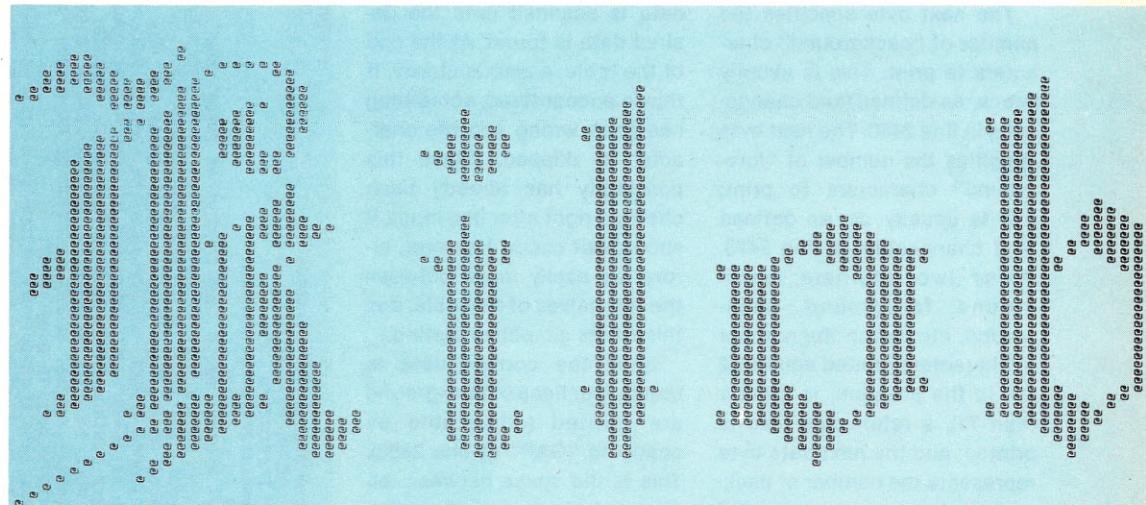
standard universal line-input routine. It allows a full line to be input, and has various facilities for editing. ("Sub" is used for Control Z, return, line feed. The Control Z causes the return to be ignored, and line feed is always ignored. This allows you to go to the next line on your terminal to continue input when you reach the end of your

register; source code is found inside INC at line 2530. OUTC (OUTput Character) is found at line 2550; the character in the A register is printed on the terminal; no registers are modified.

Also in this general area at the end of the program are two buffers that must be in RAM. "SPACE" is a one-byte tempo-

(INLEN).

The general line-input routine ends at line 870, whereupon the poster-generation program begins. First, a check is made to see if all input characters exist in the character set. This is to avoid the possibility of trying to print a poster for hours, then discovering an impossible request. If any il-



carriage. The other features should be reasonably obvious.)

Three routines, which should be tailored to your system, are called. INC (INput Character) begins at line 2500; it reads one character from the keyboard into the A register. No other registers are modified. INCLR (INput CLeaR) clears any input latches or buffers, thus avoiding trouble with keys pressed before the program is run or during printing. It modifies only the A

rary, and "BUF" is the line-input buffer, randomly selected as 72. Since the data follows at 006'000 (600 hex), the buffer could not be much larger if located at its current address. The buffer is easily moved since its location is defined in line 2490 (INBUF). The length of the buffer is also easily changed (both of these parameters can be changed without reassembling the program) since it is defined in line 2480

legal characters are found, they are printed, the line is ignored and the input routine is run again. The character set data begins with a list of characters present in the set (all with the most significant bit being zero) followed by a zero. This information is used to determine whether or not each input character exists.

Next, each character is printed. The remaining data in the character set table contains

the information used to print each letter or symbol. The first byte is the actual character (in ASCII, which is "American Standard Code for Information Interchange," not ASC-II or ASC-2 as some would have you believe). The next byte is the number of data bytes following (for the character specified by the first byte).

ed. When a non-space character (other than return) is to be printed, first spaces are printed until the counter is zero. When return line feed is printed, the counter is set to zero. This causes trailing spaces to be ignored, resulting in much faster printing except on inverse-video posters.

To print each character, the code is repeated until the do

ram A.
SH
)
ORED.
EAD
INBUF".
7. HL
NG
Included in the source code.
(With the object for the program, the data for FGW takes up just under 8K.) It has been added to our object tapes by special programs. It is doubtful that anyone would wish to type this amount of data in manually.

ly. Paper tapes are available from ALF Products (128 South Taft; Denver, CO 80228). Source code, \$3.50. Object code plus data set tape: Gothic, \$3.50; Scoreboard, \$2.50; Old English, \$3.50; Scoreboard Italic, \$3.00. Add \$1 per order for postage. ■

Program A.

The next byte specifies the number of "background" characters to print. This is usually space, as defined (and changeable) in line 2460. The next byte specifies the number of "foreground" characters to print; this is usually @, as defined (and changeable) in line 2470. These two alternate: background, foreground, background, etc. When the number of characters printed equals 72 (or, in the program, is greater than 71), a return line feed is printed; and the next data byte represents the number of background characters to be printed even if the most recent data was for background.

To create different effects,

To print each character, the data is scanned until the desired data is found. At the end of the table, a zero is stored. If this is encountered, something has gone wrong and the character is skipped. (Since this possibility has already been checked right after line input, it should not occur. However, errors are easily made between the two halves of the table, and this check simplifies testing.)

Once the correct data is found, four lines of background are printed (adjustable by changing "GAP" at line 2450). This is the space between letters and the space preceding the first letter. Another gap is printed after the last letter. Note that for the italic character

Program A.

```
0 ****
0 * POSTER GENERATION PROGRAM *
0 *      A L F PRODUCTS INC. *
0 ****
0 ORG 400H
0 * THE "GO" ROUTINE READS (AND ECHOES) AN INPUT LINE.
0 * RETURN (M) ENDS THE LINE, CANCEL (X) PRINTS BACKSLASH
0 * AND ALLOWS LINE INPUT TO BE RESTARTED, BACKSPACE (H)
0 * BACKSPACES OR PRINTS BACKSLASH IF NO CHARS LEFT TO
0 * BACK UP, ACKNOWLEDGE (F) REPRINTS THE LINE SO FAR,
0 * AND SUB (Z) CAUSES THE NEXT CHAR TO ECHO BUT BE IGNORED.
0 * ALL OTHER CONTROLS AND RUBOUT ECHO BUT ARE IGNORED.
0 * BUFFER FULL CAUSES LINE REPRINT. BUFFER LENGTH IS READ
0 * FROM "INLEN", 0=256. BUFFER LOCATION IS READ FROM "INBUF".
0 * PARITY IS MASKED TO 0 ON INPUT.
0 * CHARS ARE STORED IN BUFFER, RETURN IS STORED AS '377. HL
0 * POINTS TO THE NEXT AVAILABLE BYTE IN THE BUFFER DURING
0 * LINE INPUT, C IS THE # OF BYTES INPUT SO FAR, D IS
0 * NORMALLY 0, SET TO 377 TO IGNORE NEXT CHAR (SUB).
0 ****
```

```
0 MVI A,':' OUTPUT A :.
0 CALL OUTC
0 LHLD INBUF
0 MVI C,0
0 G06 CALL INCLR GET RID OF POSSIBLE GARBAGE.
0 G01 MVI D,0
0 G08 CALL INC
0 CALL OUTC
0 INR D
0 JZ G01
0 ANI 127
0 CPI 127
0 JZ G01 RUBOUT.
0 CPI 'M'-64
0 JZ G07 RETURN.
0 CPI 'X'-64
```

the background and foreground characters may be exchanged or set to other characters. If "BACK" is @ and "FORE" is space, an "inverse video" poster is created.

ter set, GAP should be changed to one since an inherent gap is present. (On inverse-video posters, a space should be used as the first and last character.) You may wish to replace the

001	000 000
002	072
003	006 005
004	072 005
005	000
006	003 005
007	000
008	74 005
009	006 005
010	000
011	020 004
012	77
013	77
014	020 004
015	15
016	14 004
017	30
018	029
019	020
020	021
021	022
022	023
023	024
024	025
025	026
026	027
027	028
028	029
029	030
030	031
031	032
032	033
033	034
034	035
035	036

Note that spaces are not printed immediately. When a space is to be printed (by the OUTP routine at line 2220), a counter (SPACE) is increment-

Jump at line 2170 with a jump to itself to avoid having a colon printed by the input routine at the end of your poster.

The character set data is not

004'052 312 156 004
 004'055 376 010
 004'057 312 144 004
 004'062 376 006
 004'064 312 120 004
 004'067 376 032
 004'071 312 171 004
 004'074 376 040
 004'076 332 020 004
 004'101 107
 004'102 072 171 005
 004'105 014
 004'106 271
 004'107 312 117 004
 004'112 160
 004'113 043
 004'114 303 020 004
 004'117 015
 004'120 066 000
 004'122 315 176 004
 004'125 052 172 005
 004'130 257
 004'131 266
 004'132 312 015 004
 004'135 315 206 005
 004'140 043
 004'141 303 130 004
 004'144 257
 004'145 261
 004'146 312 156 004
 004'151 015
 004'152 053
 004'153 303 020 004
 004'156 076 134
 004'160 315 206 005
 004'163 315 176 004
 004'166 303 000 004
 004'171 026 377
 004'173 303 022 004
 004'176 076 015
 004'200 315 206 005
 004'203 257
 004'204 062 222 005
 004'207 076 012
 004'211 303 206 005
 004'214 066 377
 004'216
 004'216
 004'216 052 172 005
 004'221 076 012
 004'223 315 206 005
 004'226 257
 004'227 062 222 005
 004'232
 004'232
 004'232
 004'232
 004'232
 004'232
 004'232 006 000
 004'234 021 000 006
 004'237 032
 004'240 267
 004'241 302 262 004
 004'244
 004'244 257
 004'245 266
 004'246 372 273 004
 004'251 006 377
 004'253 043
 004'254 315 206 005
 004'257 303 234 004
 004'262
 004'262 276
 004'263 023
 004'264 302 237 004
 0370 JZ G05 RESTART.
 0380 CPI 'H'-64
 0390 JZ G04 BACKSPACE.
 0400 CPI 'F'-64
 0410 JZ G03 REPRINT.
 0420 CPI 'Z'-64
 0430 JZ G09 SUB.
 0440 CPI ''
 0450 JC G01 CONTROL CHARS.
 0460 MOV B,A
 0470 LDA INLEN
 0480 INR C
 0490 CMP C
 0500 JZ G02 BUFFER FULL.
 0510 MOV M,B
 0520 INX H
 0530 JMP G01 ALL WENT WELL.
 0540 G02 DCR C (BUFFER FULL.)
 0550 G03 MVI M,0 (REPRINT.) END MARKER.
 0560 CALL CRLF
 0570 LHLD INBUF
 0580 G010 XRA A
 0590 ORA M
 0600 JZ G06
 0610 CALL OUTC
 0620 INX H
 0630 JMP G010
 0640 G04 XRA A (BACKSPACE.)
 0650 ORA C
 0660 JZ G05 NOTHING TO BACK UP.
 0670 DCR C
 0680 DCX H
 0690 JMP G01
 0700 G05 MVI A,92 (RESTART.)
 0710 CALL OUTC
 0720 CALL CRLF
 0730 JMP G0
 0740 G09 MVI D,255 (SUB.)
 0750 JMP G08
 0760 CRLF MVI A,'M'-64 PRINT RETURN LINEFEED.
 0770 CALL OUTC
 0780 XRA A
 0790 STA SPACE RESET "SPACE" COUNT.
 0800 MVI A,'J'-64
 0810 JMP OUTC
 0820 G07 MVI M,255 (RETURN.)
 0830 * END OF LINE. SET LINE POINTER TO 1ST CHAR
 0840 * & PRINT LINEFEED.
 0850 LHLD INBUF
 0860 MVI A,'J'-64
 0870 CALL OUTC
 0880 XRA A
 0890 STA SPACE INITIALIZE "SPACE".
 0900 * FIRST CHECK TO SEE THAT ALL INPUT CHARS EXIST
 0910 * IN THE DATA. FORMAT OF FIRST PART OF TABLE IS
 0920 * A LIST OF AVAILABLE CHARS FOLLOWED BY A 0.
 0930 * B IS NORMALLY 0, IS SET TO -1 IF ERROR FOUND.
 0940 * (BAD CHARS ARE PRINTED.) DE IS TABLE POINTER,
 0950 * HL IS BUFFER POINTER.
 0960 MVI B,0
 0970 CHK LX1 D, TABLE
 0980 CHK3 LDAX D
 0990 ORA A
 1000 JNZ CHK1
 1010 * NOT IN TABLE. END OF BUFFER OR BAD CHAR?
 1020 XRA A
 1030 ORA M
 1040 JM CHK2 END OF BUFFER.
 1050 MVI B,255 BAD CHAR FOUND.
 1060 INX H
 1070 CALL OUTC
 1080 JMP CHK
 1090 * CHECK TABLE ENTRY.
 1100 CHK1 CMP M FOUND IN TABLE?
 1110 INX D
 1120 JNZ CHK3 NOT YET.
 004'267 043
 004'270 303 234 004
 004'273
 004'273 004
 004'274 302 305 004
 004'277
 004'277 315 176 004
 004'302 303 000 004
 004'305
 004'305
 004'305 023
 004'306 052 172 005
 004'311
 004'311
 004'311
 004'311 353
 004'312
 004'312 032
 004'313 267
 004'314 372 062 005
 004'317 345
 004'320 006 000
 004'322 257
 004'323 266
 004'324 302 334 004
 004'327
 004'327 341
 004'330 023
 004'331 303 312 004
 004'334
 004'334 032
 004'335 276
 004'336 312 350 004
 004'341 043
 004'342 116
 004'343 043
 004'344 011
 004'345 303 322 004
 004'350 043
 004'351 116
 004'352 043
 004'353
 004'353
 004'353
 004'353
 004'353 325
 004'354 072 166 005
 004'357 127
 004'360 036 110
 004'362 072 167 005
 004'365 315 114 005
 004'370 035
 004'371 302 362 004
 004'374 315 176 004
 004'377 025
 005'000 302 360 004
 005'003
 005'003 072 167 005
 005'004 127
 005'007 072 170 005
 005'012 137
 005'013 006 000
 005'015 176
 005'016 345
 005'017 147
 005'020 200
 005'021 107
 005'022 172
 005'023 315 114 005
 005'026 045
 005'027 302 022 005
 005'032 172
 1130 INX H FOUND.
 1140 JMP CHK CHECK NEXT.
 1150 * ALL CHARS CHECKED. ANY BAD ONES?
 1160 CHK2 INR B
 1170 JNZ PRNT NO BAD ONES.
 1180 * BAD CHARS FOUND, CRLF AND GO BACK TO INPUT.
 1190 CALL CRLF
 1200 JMP GO
 1210 *
 1220 * PRINT THE POSTER.
 1230 *
 1240 PRNT INX D DE POINTS TO THE SECOND HALF OF THE TABLE.
 1250 LHLD INBUF HL POINTS TO INPUT BUFFER.
 1260 * SECOND HALF OF TABLE CONTAINS MANY ENTRIES, EACH
 1270 * CONSISTS OF: (1) THE CHAR FOR WHICH DATA FOLLOWS,
 1280 * (2) THE LENGTH OF THE DATA FOLLOWING, AND (3)
 1290 * THE DATA. WHEN ITEM (1) IS 0, END-OF-TABLE IS FOUND.
 1300 XCHG
 1310 * DE WILL BE THE BUFFER POINTER, HL THE TABLE POINTER.
 1320 FIND1 LDAX D END OF BUFFER?
 1330 ORA A
 1340 JM DONE YES.
 1350 PUSH H NO, SAVE TABLE POINTER.
 1360 MVI B,0 FOR DAD B.
 1370 FIND2 XRA A
 1380 ORA M
 1390 JNZ FIND3
 1400 * END-OF-TABLE FOUND (ERROR). SKIP CHAR AND PROCEED.
 1410 NEXT POP H RECOVER TABLE POINTER.
 1420 INX D
 1430 JMP FIND1
 1440 * LOOK FOR CORRECT DATA.
 1450 FIND3 LDAX D
 1460 CMP M MATCH?
 1470 JZ FIND4 YES. DATA FOUND.
 1480 INX H
 1490 MOV C,M NO MATCH, LOAD LENGTH INTO BC.
 1500 INX H
 1510 DAD B SKIP OVER DATA.
 1520 JMP FIND2 TRY NEXT DATA.
 1530 FIND4 INX H
 1540 MOV C,M
 1550 INX H
 1560 * CORRECT DATA FOUND. HL NOW POINTS TO DATA, C IS LENGTH
 1570 * OF DATA. FOR EACH LINE, FIRST BYTE IS NUMBER OF BACKGROUND
 1580 * CHARS TO PRINT, NEXT BYTE IS NUMBER OF FOREGROUND CHARS
 1590 * TO PRINT, THEN BACKGROUND, ETC. WHEN TOTAL CHARS ON LINE
 1600 * SO FAR IS 72, CRLF AND START NEXT LINE. PRECEDE EACH
 1610 * CHAR WITH A FEW LINES OF BACKGROUND.
 1620 PUSH D
 1630 LDA GAP # OF LINES BETWEEN.
 1640 MOV D,A
 1650 PRNT1 MVI E,72
 1660 PRNT2 LDA BACK
 1670 CALL OUTP
 1680 DCR E
 1690 JNZ PRNT2
 1700 CALL CRLF
 1710 DCR D
 1720 JNZ PRNT1
 1730 * GAP PRINTED. PROCEED WITH CHAR. REMEMBER DE IS ON STACK.
 1740 PRNT3 LDA BACK
 1750 MOV D,A
 1760 LDA FORE
 1770 MOV E,A AT NEW LINE: D IS BACK, E IS FORE.
 1780 MVI B,0 B IS CHAR COUNT SO FAR.
 1790 PRNT5 MVI A,M GET COUNT.
 1800 PUSH H
 1810 MOV H,A
 1820 ADD B
 1830 MOV B,A UPDATE COUNT SO FAR.
 1840 PRNT4 MVI A,D GET CHAR TO PRINT.
 1850 CALL OUTP
 1860 DCR H
 1870 JNZ PRNT4
 1880 MVI A,D

005'033 123
 005'034 137
 005'035 341
 005'036 043
 005'037 015
 005'040 076 107
 005'042 270
 005'043 322 015 005
 005'046
 005'046 315 176 004
 005'051 015
 005'052 014
 005'053 302 003 005
 005'056
 005'056 321
 005'057 303 327 004
 005'062
 005'062 072 166 005
 005'065 127
 005'066 036 110
 005'070 072 167 005
 005'073 315 114 005
 005'076 035
 005'077 302 070 005
 005'102 315 176 004
 005'105 025
 005'106 302 066 005
 005'111
 005'111 303 000 004
 005'114
 005'114
 005'114
 005'114
 005'114 376 040
 005'116 312 154 005
 005'121 365
 005'122 072 222 005
 005'125 074
 005'126 075
 005'127 062 222 005
 005'132 312 150 005
 005'135 076 040
 005'137 315 206 005
 005'142 072 222 005
 005'145 303 126 005
 005'150 361
 005'151 303 206 005
 005'154
 005'154 072 222 005
 005'157 074
 005'160 062 222 005
 005'163 076 040
 005'165 311
 005'166
 005'166
 005'166 004
 005'167 040
 005'170 100
 005'171 110
 005'172 223 005
 005'174 333 176
 005'176 346 001
 005'200 312 174 005
 005'203 333 177
 005'205 311
 005'206 365
 005'207 333 176
 005'211 346 200
 005'213 312 207 005
 005'216 361
 005'217 323 177
 005'221 311
 005'222
 005'223
 005'333

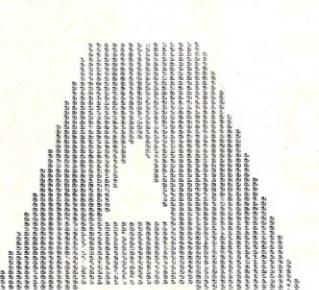
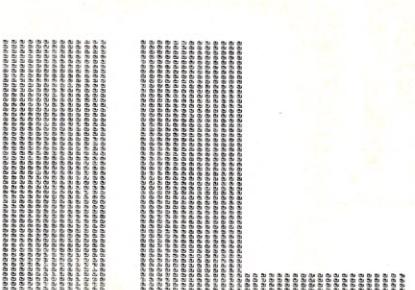
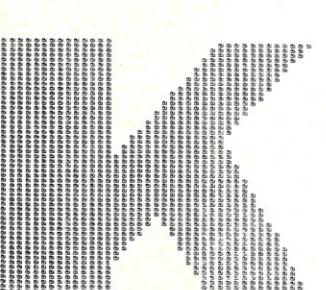
1890 MOV D,E
 1900 MOV E,A SWITCH BACK & FORE.
 1910 POP H
 1920 INX H
 1930 DCR C ONE MORE BYTE OF DATA USED.
 1940 MVI A,71
 1950 CMP B LINE DONE?
 1960 JNC PRNTS NO.
 1970 * END OF LINE REACHED, END OF WHOLE CHAR TOO?
 1980 CALL CRLF
 1990 DCR C
 2000 INR C
 2010 JNZ PRNT3 NO, DO NEXT LINE.
 2020 * END OF WHOLE CHAR.
 2030 POP D
 2040 JMP NEXT
 2050 * END OF POSTER, PRINT TRAILING GAP.
 2060 DONE LDA GAP * OF LINES.
 2070 MOV D,A
 2080 DONE1 MVI E,72
 2090 DONE2 LDA BACK
 2100 CALL OUTP
 2110 DCR E
 2120 JNZ DONE2
 2130 CALL CRLF
 2140 DCR D
 2150 JNZ DONE1
 2160 * GAP PRINTED. GO BACK TO INPUT.
 2170 JMP GO
 2180 * OUTP ROUTINE PRINTS BUT SKIPS SPACES, SPACES ARE
 2190 * COUNTED SO THEY CAN BE PRINTED IF NECESSARY, BUT
 2200 * TRAILING SPACES WILL NEVER BE PRINTED. COUNT OF
 2210 * SPACES LEFT IS IN "SPACE".
 2220 OUTP CPI ','
 2230 JZ OUTP1
 2240 PUSH PSW
 2250 LDA SPACE
 2260 INR A
 2270 OUTP2 DCR A
 2280 STA SPACE
 2290 JZ OUTP3
 2300 MVI A,''
 2310 CALL OUTC
 2320 LDA SPACE
 2330 JMP OUTP2
 2340 OUTP3 POP PSW
 2350 JMP OUTC
 2360 * SPACE FOUND. JUST COUNT IT.
 2370 OUTP1 LDA SPACE
 2380 INR A
 2390 STA SPACE
 2400 MVI A,'' JUST TO BE NICE.
 2410 RET
 2420 * CONSTANTS, BUFFERS, TABLES, AND I/O ROUTINES.
 2430 PSW EQU 6
 2440 SP EQU 6
 2450 GAP DB 4
 2460 BACK DB ','
 2470 FORE DB 'e'
 2480 INLEN DB 72
 2490 INBUF DW BUF
 2500 INC IN 126
 2510 ANI 1
 2520 JZ INC
 2530 INCLR IN 127
 2540 RET
 2550 OUTC PUSH PSW
 2560 OUTC1 IN 126
 2570 ANI 128
 2580 JZ OUTC1
 2590 POP PSW
 2600 OUT 127
 2610 RET
 2620 SPACE DS 1
 2630 BUF DS 72
 2640 TABLE EQU 600H

011'020: 006 006 074 006 006 074 006 006 074 006 006 074 006 006 074 006
 011'040: 006 074 006 006 074 006 006 074 006 006 074 006 006 074 006 006 115 077
 011'060: 006 060 022 006 060 022 006 060 022 056 010 022 054 010 024 052
 011'100: 010 026 050 010 030 046 010 032 044 010 034 044 006 036 044 006
 011'120: 036 044 006 036 044 010 034 046 010 032 050 010 030 052 010 026
 011'140: 054 010 024 056 010 022 006 060 022 006 060 022 006 060 022 006 116
 011'160: 077 006 060 022 006 056 024 006 054 026 050 010 030 046 010 032
 011'200: 044 010 034 042 010 036 040 010 040 036 010 042 034 010 044 032
 011'220: 010 046 030 010 050 026 010 052 024 010 054 022 010 056 020 010
 011'240: 060 016 010 062 014 010 064 012 054 022 010 056 022 006 060 022
 011'260: 117 077 012 050 026 010 054 024 006 060 022 006 006 044 006 022
 011'300: 006 006 044 006 022 006 006 044 006 022 006 006 044 006 022 006
 011'320: 006 044 006 022 006 006 044 006 022 006 006 044 006 022 006 006
 011'340: 044 006 022 006 006 044 006 022 006 006 022 010 054 024 012 050
 011'360: 026 120 077 006 060 022 006 060 022 006 060 022 006 014 006 006
 012'000: 022 036 006 014 006 022 036 006 014 006 022 036 006 014 006 022
 012'020: 036 006 014 006 022 036 006 014 006 022 036 006 014 006 022 036
 012'040: 006 014 006 022 036 006 014 006 022 036 030 022 040 024 024 042
 012'060: 020 026 121 103 026 026 034 024 024 032 022 036 030 020 010 022
 012'100: 010 026 016 010 026 010 024 014 010 032 010 022 014 006 036 006
 012'120: 022 014 006 036 006 022 014 006 036 006 022 014 014 026 010 022
 012'140: 014 012 026 010 024 014 010 026 012 026 012 046 030 010 010 004
 012'160: 032 032 006 010 010 026 034 122 144 006 060 022 006 060 022 006
 012'200: 060 022 034 010 014 006 022 032 012 014 006 022 030 014 014 006
 012'220: 022 026 016 014 006 022 024 010 002 006 014 006 022 010 004 004
 012'240: 006 014 006 022 020 010 006 004 014 006 022 016 010 010 006 014
 012'260: 006 022 014 010 012 006 014 006 022 012 010 014 006 014 006 022
 012'300: 010 010 016 006 014 006 022 004 010 020 006 014 006 022 006 006
 012'320: 022 030 022 006 004 026 024 024 006 002 032 020 026 123 135 006
 012'340: 006 026 020 026 006 006 024 024 024 006 006 022 030 022 006 006
 012'360: 022 006 014 006 022 006 006 022 006 006 014 006 022 006 006 022
 013'000: 014 006 022 006 006 022 006 014 006 022 006 006 022 006 014 006
 013'020: 022 006 006 022 006 014 006 022 006 006 022 006 014 006 022 006
 013'040: 006 022 006 014 006 022 006 006 022 006 006 014 006 022 006 036 014
 013'060: 006 022 010 032 016 006 022 012 026 020 006 022 124 055 060 006
 013'100: 022 060 006 022 060 006 022 060 006 022 060 006 022 060 006 022
 013'120: 006 060 022 060 006 022 060 006 022 060 006 022 060 006 022 060
 013'140: 006 022 060 006 022 060 006 022 060 006 022 060 006 022 054 022
 013'160: 010 056 022 060 006 022 006 006 074 006 006 074 006 006 074 006
 013'200: 006 074 006 006 074 006 006 074 006 006 074 006 006 074 006 006
 013'220: 074 006 060 022 010 056 022 012 054 022 126 055 020 046 022 016
 013'240: 050 022 014 052 022 012 010 066 010 010 070 006 010 072 006 006
 013'260: 074 006 006 074 006 006 074 006 010 072 010 010 070 012 010 066
 013'300: 014 052 022 016 050 022 020 046 022 127 077 006 060 022 006 060
 013'320: 022 006 060 022 006 010 072 010 010 070 012 010 066 014 010 064
 013'340: 016 010 062 020 010 060 022 006 006 060 022 006 060 022 006 060 020
 013'360: 010 060 016 010 062 014 010 064 012 010 066 010 010 070 006 010
 014'000: 072 006 060 022 006 060 022 006 060 022 130 137 006 010 040 010
 014'020: 022 010 010 034 010 024 012 010 030 010 026 014 010 024 010 030
 014'040: 016 010 020 010 032 020 010 014 010 034 022 010 010 036 024
 014'060: 010 004 010 040 026 020 042 030 014 044 030 014 044 030 014 044
 014'100: 026 020 042 024 010 004 010 040 022 010 010 010 036 020 010 014
 014'120: 010 034 016 010 020 010 032 014 010 024 010 030 012 010 030 010
 014'140: 026 010 010 034 010 024 006 010 022 131 055 056 010 022
 014'160: 054 010 024 052 010 026 050 010 030 046 010 032 044 010 034 006
 014'200: 044 036 006 044 036 006 044 036 044 010 034 046 010 032 050 010
 014'220: 030 052 010 026 054 010 024 056 010 022 132 203 006 010 042 006
 014'240: 022 006 012 040 006 022 006 014 036 006 022 006 014 034 006 022
 014'260: 006 006 002 010 032 006 022 006 006 004 010 030 006 006 022 006
 014'300: 006 010 024 006 022 006 006 010 024 006 022 006 006 010 024 006
 014'320: 022 006 022 006 006 014 010 020 006 022 006 006 014 010 016 006
 014'340: 022 006 006 020 010 014 006 022 006 006 022 010 012 006 022 006
 014'360: 006 024 010 010 006 022 006 006 024 010 006 006 022 006 006 030
 015'000: 010 004 006 022 006 006 032 010 002 006 022 006 006 034 016 022
 015'020: 006 006 036 014 022 006 006 040 012 022 006 006 042 010 022 061
 015'040: 041 006 006 036 010 026 006 006 040 010 024 006 006 042 010 022
 015'060: 006 060 022 006 060 022 006 060 022 006 060 022 006 060 022 006
 015'100: 006 074 062 135 006 024 020 010 026 006 026 020 010 024 006 030
 015'120: 020 010 022 006 014 006 022 006 006 024 010 026 006 014 006 022
 015'140: 022 006 006 014 006 022 006 006 014 006 022 006 006 014 006 022
 015'160: 006 014 006 022 006 022 006 006 014 006 022 006 022 006 006 014
 015'200: 006 022 006 022 006 006 014 006 022 006 022 006 006 014 006 022
 015'220: 006 022 006 006 014 036 022 006 006 016 032 024 006 006 020 026
 015'240: 026 063 131 012 010 036 006 022 010 010 040 006 022 006 010 042
 015'260: 006 022 006 006 044 006 022 006 006 044 006 022 006 006 044 006
 015'300: 022 006 006 026 004 012 006 022 006 006 024 010 006 022 006 006

Program B. Football Scoreboard poster data.

006'000: 101 102 103 104 105 106 107 110 111 112 113 114 115 116 117 120
 006'020: 121 122 123 124 125 126 127 130 131 132 061 062 063 064 065 066
 006'040: 067 070 071 040 054 054 073 077 041 072 042 047 050 051 055 000
 006'060: 101 077 006 046 034 006 050 032 006 052 030 030 006 014 010 026
 006'100: 030 006 016 010 024 030 006 020 010 022 030 006 022 006 022 030
 006'120: 006 022 006 022 030 006 022 006 022 030 006 020 010 022 030 006
 -006'140: 016 010 024 030 006 014 010 026 006 052 030 006 050 032 006 046
 006'160: 034 102 125 006 060 022 006 060 022 006 060 022 006 006 022 006
 006'200: 014 006 022 006 006 022 006 014 006 022 006 006 022 006 014 006
 006'220: 022 006 006 022 006 014 006 022 006 006 022 006 014 006 022 006
 006'240: 006 022 006 014 006 022 006 006 020 010 014 006 022 006 006 016
 006'260: 012 014 006 022 006 014 014 006 022 006 060 022 010 024 026
 006'300: 004 024 024 012 020 010 020 026 103 105 012 050 026 010 054 024
 006'320: 006 060 022 006 006 044 006 022 006 006 044 006 022 006 006 044
 006'340: 006 022 006 006 044 006 022 006 006 044 006 022 006 006 044 006
 006'360: 022 006 006 044 006 022 006 006 044 006 022 006 006 044 006 022
 007'000: 006 010 040 010 022 010 010 034 010 024 012 010 030 010 026 104
 007'020: 077 006 060 022 006 060 022 006 006 006 044 006 022 006 006 022
 007'040: 006 044 006 022 006 006 044 006 022 006 006 044 006 022 006 006
 007'060: 044 006 022 006 006 044 006 022 006 010 040 010 022 010 010 034
 007'100: 010 024 012 010 030 010 026 014 044 030 016 040 032 020 034 034
 007'120: 105 127 006 060 022 006 060 022 006 006 022 006 006 022 006 014
 007'140: 006 022 006 006 022 006 014 006 022 006 006 022 006 014 006 022
 007'160: 006 006 022 006 014 006 022 006 006 022 006 014 006 022 006 006
 007'200: 022 006 014 006 022 006 006 022 006 014 006 022 006 014 006 022
 007'220: 014 006 022 006 006 022 006 014 006 022 006 006 022 006 006 022
 007'240: 006 044 006 022 006 006 044 006 022 106 077 006 060 022 006 060
 007'260: 022 006 060 022 036 006 014 006 022 036 006 014 006 022 036 006
 007'300: 014 006 022 036 006 014 006 022 036 006 014 006 022 036 006 014
 007'320: 006 022 036 006 014 006 022 036 006 014 006 022 036 006 014 006
 007'340: 022 060 006 022 060 006 022 060 006 022 107 113 012 050 026 010
 007'360: 054 024 006 060 022 006 006 044 006 022 006 006 044 006 022 006
 010'000: 006 044 006 022 006 006 044 006 022 006 006 044 006 022 006 006
 010'020: 044 006 022 006 006 014 006 022 006 006 014 006 022 006 006 006
 010'040: 022 006 006 014 006 022 006 006 020 010 022 010 026 016
 010'060: 010 024 012 024 014 010 026 110 055 006 060 022 006 022 006
 010'100: 060 022 036 006 044 036 006 044 036 006 044 036 006 044 036 006
 010'120: 044 036 006 044 036 006 044 036 006 044 036 006 044 036 006 022
 010'140: 006 060 022 006 060 022 111 047 006 006 044 006 022 006 006 044
 010'160: 006 022 006 006 044 006 022 006 006 060 022 006 060 022 006 022
 010'200: 006 006 044 006 022 006 006 044 006 022 006 006 044 006 022 112
 010'220: 044 012 010 066 010 010 070 006 010 072 006 006 074 006 006 074
 010'240: 006 006 074 006 006 074 006 006 074 006 006 074 006 006 074 006
 010'260: 056 022 012 054 022 113 110 006 060 022 006 060 022 006 060 022
 010'300: 030 010 050 032 010 046 034 010 044 034 012 042 032 016 040 030
 010'320: 022 036 026 010 006 010 034 024 010 012 010 032 022 010 016 010
 010'340: 030 020 010 022 010 026 016 010 026 010 024 014 010 032 010 022
 010'360: 012 010 036 006 022 010 010 042 004 022 006 010 046 002 022 114
 011'000: 055 006 060 022 006 060 022 006 006 074 006 006 074 006 006 074

015'320: 006 022 014 006 006 022 006 006 020 020 004 006 022 006 006 016
 015'340: 010 004 010 002 006 022 006 006 014 010 010 016 022 006 030 014
 015'360: 014 022 010 024 020 012 022 012 020 024 010 022 064 067 036 010
 016'000: 042 036 012 040 036 014 036 036 016 034 036 006 006 002 010 032 036
 016'020: 006 004 010 030 036 006 006 010 026 036 006 010 010 024 036 006
 016'040: 012 010 022 006 060 022 006 060 020 022 006 060 022 036 006 044 036
 016'060: 006 044 036 006 044 065 135 012 010 014 030 022 010 010 016 030
 016'100: 022 006 010 020 030 022 006 006 022 006 014 006 022 006 006 022
 016'120: 006 014 006 022 006 006 022 006 006 014 006 022 006 006 022 006
 016'140: 006 022 006 006 022 006 014 006 022 006 006 022 006 006 014 006 022
 016'160: 006 006 022 006 014 006 022 006 006 014 006 022 006 006 014 006 006
 016'200: 022 006 014 006 022 006 006 033 014 006 022 006 010 032 016 006 022 012
 016'220: 026 020 006 022 066 127 012 012 050 026 010 054 024 024 006 060 022 006
 016'240: 006 022 006 014 006 022 006 006 006 022 006 014 006 022 006 006 022
 016'260: 006 014 006 022 006 006 022 006 006 014 006 022 006 006 022 006 014
 016'300: 006 022 006 006 022 006 014 006 022 006 006 022 006 006 014 006 022
 016'320: 006 006 022 006 014 006 022 006 006 022 006 014 006 022 006 006 014
 016'340: 012 010 022 010 032 012 010 024 012 026 012 010 026 012 010 026 067 071 060
 016'360: 006 022 060 006 022 060 006 022 060 006 022 060 006 022 060 006 022 060
 017'000: 022 006 032 020 006 022 006 034 016 006 022 006 036 014 006 022 006 022
 017'020: 036 010 012 006 022 040 010 010 006 022 042 010 006 006 022 044
 017'040: 022 022 046 020 022 050 016 022 070 031 012 020 010 020 026 010
 017'060: 024 004 024 024 006 060 022 006 006 014 014 014 006 022 006 006 022
 017'100: 014 012 016 006 022 006 014 006 022 006 014 010 020 006 022 006 006 014
 017'120: 022 006 022 006 006 014 006 022 006 006 022 006 006 014 006 022 006
 017'140: 022 006 006 014 010 020 006 022 006 006 014 012 012 016 006 022 006 022
 017'160: 006 014 014 014 006 022 006 006 060 022 010 024 004 024 024 012 020
 017'200: 010 020 026 071 127 012 010 012 026 026 010 010 012 032 024 006
 017'220: 010 012 036 022 006 006 014 006 022 006 006 014 006 022 006 006 006 014
 017'240: 006 022 006 006 014 006 022 006 006 022 006 006 014 006 022 006 006 022
 017'260: 006 006 014 006 022 006 006 022 006 006 014 006 022 006 006 022 006 006
 017'300: 014 006 022 006 006 014 006 022 006 006 014 006 022 006 006 014 006 006 014
 017'320: 022 006 022 006 006 060 022 010 054 024 012 010 050 026 040 022 110 110
 017'340: 110 110 110 110 110 110 110 110 110 110 110 110 110 110 110 110 110 110
 017'360: 056 022 012 004 072 010 010 070 006 014 066 006 014 066 006 014 066 010 010
 020'000: 070 012 004 072 054 025 006 002 100 006 004 076 006 006 006 006 006 074 006
 020'020: 014 066 010 012 066 012 010 066 110 110 110 073 037 006 002 100 000
 020'040: 006 004 076 006 006 074 006 014 004 004 004 056 010 012 002 010 054 006 014
 020'060: 012 024 052 022 014 052 024 010 054 026 004 056 006 056 077 072 052 010
 020'100: 026 054 010 024 056 010 022 060 006 022 060 006 022 060 006 022 060 006 022
 020'120: 006 006 016 020 006 022 006 006 022 006 006 022 006 006 022 006 006 022 006
 020'140: 006 022 014 006 022 034 006 014 006 022 034 006 014 006 022 034 006 014 006 022
 020'160: 006 014 006 022 036 030 022 040 024 024 042 020 026 041 017 006 022 041 017
 020'200: 006 006 044 022 006 006 006 044 022 006 006 044 022 006 006 044 022 072 032
 020'220: 012 004 010 004 056 010 010 004 010 054 006 030 052 006 030 052 006 030 052
 020'240: 010 010 004 010 054 012 004 010 004 054 042 025 052 014 022 052 014
 020'260: 014 022 052 014 022 110 110 110 052 014 022 052 014 022 052 014 022 052 014
 020'300: 022 047 022 052 002 034 052 004 032 052 006 030 052 014 022 054 014 022 054
 020'320: 012 022 056 010 022 050 047 020 034 034 016 040 032 014 044 030 014 044 030
 020'340: 012 010 030 010 026 010 010 034 010 024 006 010 040 010 022 006 010 022
 020'360: 006 044 006 022 006 004 050 004 002 022 006 002 005 004 002 022 006 002 054 006
 021'000: 006 002 054 002 022 006 004 050 004 002 022 006 006 044 006 006 022 006 006
 021'020: 010 040 010 022 010 010 034 010 024 012 010 030 010 010 026 014 044
 021'040: 030 016 040 032 020 034 034 055 044 036 006 044 036 006 044 036 006 044 036
 021'060: 006 044 036 006 044 036 006 044 036 006 044 036 006 044 036 006 044 036 006 044
 021'100: 044 036 006 044 036 006 044 036 006 044 036 006 044 036 006 044 036 006 044 000



INSTANT SOFTWARE™

*IMP™ for **TRS-80** ONLY \$7.95 ea.

Level I on one side, Level II on the other



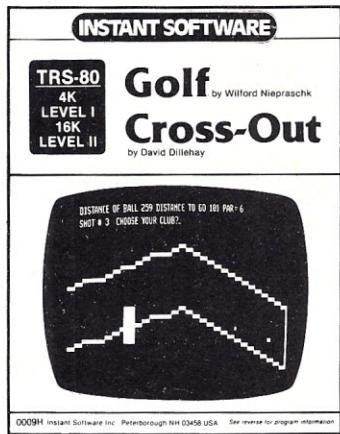
SPACE TREK II—by KB1 (for the TRS-80™) This Space Trek game will challenge the most skillful and careful player. As commander of the Enterprise, you must defend the galaxy against enemy Klingon warships using your arsenal of phasers and photon torpedoes to best advantage. The Enterprise is also equipped with impulse power for moving within the quadrant, and warp power for jumping from quadrant to quadrant. \$7.95. Order no. 0002R.



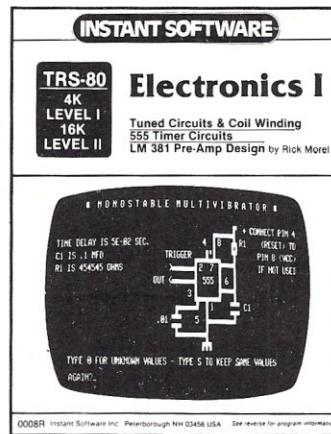
BASIC LUNAR LANDER/INTERMEDIATE LUNAR LANDER—by KB1 (for TRS-80™) Your automatic landing system has malfunctioned and you are forced to make a manual landing. Taking control at 15,000 feet, the pilot's success requires precise manipulation of the lunar lander's retro-rockets. After mastering the basic game, the able commander will be taxed by the difficult intermediate program. \$7.95. Order no. 0001R.



BEGINNER'S BACKGAMMON/KENO—by Fred Schild and KB1 (for the TRS-80™) You will never be in need of a backgammon companion again! Schild's program is designed for the newcomer to the game, but the computer's steady play will challenge the careless expert. KENO is a popular Las Vegas gambling game. As in many games of chance, the odds are against you, but when you win you can win big. \$7.95. Order no. 0004R.



GOLF/CROSS-OUT—by Wilford Nieprasch and David Dillehay. Playing golf on a computer? You bet and frustrating, too. You have your choice of seven clubs—three irons, three woods, a chip and a putter. The program has 18 different fairways, each diabolically designed. You have to pick the right club and angle for hitting the ball or else you end up in the woods or a trap. The green calls for putting skill. The program has excellent graphics and you'll have a ball... golf ball. **CROSS-OUT** is the old peg puzzle, but in computer form. You have to jump pegs, removing each one jumped. The idea is to end up with but one peg, and that one in the middle hole. The program will rate your skill at the end of each try. \$7.95. Order no. 0009R.



ELECTRONICS I—by Rick Morel. With this group of five programs you will be able to design coils for radio circuits, calculate the component values for tuned circuits, design preamplifiers using the LM-381 IC and timer circuits, either monostable or astable using the 555 timer IC.

Coils can be designed with the use of tables or special calculators, but they are difficult to use. This package has a coil designing program which is simple to use and the computer does all the work.

There is also a program for designing tuned circuits, audio or radio frequency—fixed or variable frequency.

The LM-381 program draws the circuit diagram and gives you the component values for your needs. It will calculate any unknown values for you. The two 555 programs do the same, giving you the diagrams for either one-shot timers or astable timing systems (clocks). It will do all the calculations for you, providing times or component values.

These programs are not only helpful around any workshop or lab, they also are wonderful for teaching the fundamentals of electronics to newcomers. \$7.95. Order no. 0008R.



HAM PACKAGE I—by Rick Morel and D. A. Lien. This group of eight programs (we like to give you plenty) will be of frequent help to any experimental ham operator.

OHM'S LAW CALCULATIONS SERIES CAPACITANCES

FREQUENCY VS REACTANCE PARALLEL CAPACITANCES

SERIES RESISTANCES DIPOLE DESIGN

PARALLEL RESISTANCES YAGI DESIGN

These programs draw the circuits or antennas involved and let you fill in the pertinent data, giving you the dimensions, etc.

This series of programs is not only an excellent way to learn the fundamentals of electronics and the handling of simple formulas, they will also be of constant use in any workshop or hamshack. \$7.95. Order no. 0007R.

INSTANT SOFTWARE™

*IMP™ for PET

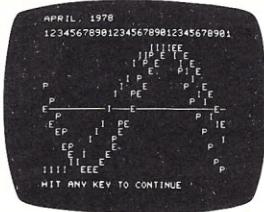
INSTANT
SOFTWARE™
for your
PET

INSTANT
SOFTWARE™
for your
PET

INSTANT SOFTWARE

PET 8K

Personal Weight Control and Biorhythms
by Microcosm



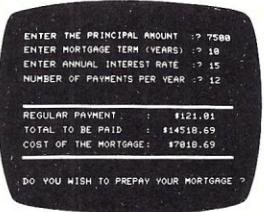
APRIL, 1978
1234567890123456789012345678901
P E P I P E P I P E P I P E P I P E
E P I P E P I P E P I P E P I P E P I P E
E P I P E P I P E P I P E P I P E P I P E
I I I I E E E E E E E E E E E E E E
HIT ANY KEY TO CONTINUE

0005P Instant Software Inc., Peterborough NH 03456 USA. See reverse for program information

INSTANT SOFTWARE

PET 8K

Mortgage with Prepayment and Financier
by Microcosm



ENTER THE PRINCIPAL AMOUNT : ? 7500
ENTER MORTGAGE TERM (YEARS) : ? 16
ENTER ANNUAL INTEREST RATE : ? 15
NUMBER OF PAYMENTS PER YEAR : ? 12

REGULAR PAYMENT : #121.01
TOTAL TO BE PAID : #14516.69
COST OF THE MORTGAGE : #7018.69

DO YOU WISH TO PREPAY YOUR MORTGAGE ?

0006P Instant Software Inc., Peterborough NH 03456 USA. See reverse for program information

• **PERSONAL WEIGHT CONTROL/**

BIORHYTHMS—by Microcosm (for PET™) Here's a program that will let you chart any individual's biorhythm cycle, showing physical, emotional, and intellectual highs and lows. If your neighbors find out you've got it, they will never leave you in peace. **PERSONAL WEIGHT CONTROL** is a must for the diet-conscious. Once your ideal weight has been determined, the program will calculate the correct daily caloric intake necessary to reach your goal over a certain time period. \$7.95. Order no. 0005P.

\$7.95 ea.

• **MORTGAGE WITH PREPAYMENT**

OPTION/FINANCIER—by Microcosm (for PET™)

Before you go to the bank, calculate your mortgage payment schedule and find out what you can afford. You will learn how much prepayments save, and can easily compare the true costs of variations in interest. **FINANCIER** is actually three programs in one and is guaranteed to make you a financial wizard. In part I you'll learn to tell which investments will pay off. Part II calculates annual depreciation schedules, providing rates, amounts, and salvage values, which is great when tax time rolls around. The final section figures costs of borrowing, payment terms, and remaining balances on loans of all sizes. \$7.95. Order no. 0006P.

• **CASINO I** by Charles M. Stuart. There are blackjack games galore, but not many of them are so dependable that you can use them to prepare to make your fortune at Vegas. This blackjack program is not only fun to play, it is also tutorial and allows you to play every combination which you could play at the MGM Grand Hotel in Las Vegas.

There are several systems which will beat the house at blackjack, but before you go investing your cash in a get rich quick attempt, try out your system on this program and see how it does in actual practice.

Roulette programs are more difficult to find, yet this is another very popular casino game—and one you'll want to get some experience with before you venture to go up against the professionals at Vegas. Remember that there are a lot of people who have worked out systems to beat the house at these games and they make a comfortable living going to Vegas every now and then to rebuild their fortunes.

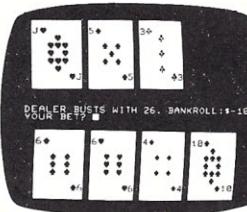
This roulette program is tutorial and gives you the odds on each type of bet.

All you need is the expertise and a little luck to go along with it and you'll pay for your computer in no time. \$7.95. Order no. 0014P.

INSTANT SOFTWARE

PET 8K

Casino I
Blackjack/Roulette
by Charles M. Stuart



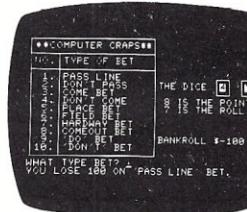
DEALER BUSTS WITH 26. BANKROLL: \$-100
6♦ 6♦ 4♦ 10♦
6♦ 6♦ 4♦ 10♦

0014P Instant Software Inc., Peterborough NH 03456 USA. See reverse for program information

INSTANT SOFTWARE

PET 8K

Casino II
Craps
by Charles M. Stuart



COMPUTER CRAPS
1. PASS LINE
2. DON'T PASS
3. DON'T COME
4. COME
5. FIVE BET
6. SIX BET
7. COMEOUT BET
8. DON'T BET
BANKROLL \$-100
WHAT TYPE BET? 1
YOU LOSE 100 ON PASS LINE BET.

0015P Instant Software Inc., Peterborough NH 03456 USA. See reverse for program information

• **CASINO II** by Charles M. Stuart—Yes, there are a lot of craps programs around—so why should you buy this one? The big difference is that this one is not just a crap game, it is also a tutorial program which will give you the odds on every type of bet so you can steer clear of the idiot bets that impoverish the unwary. Did you know that there are bets which give the house as little as 0.8% advantage? It takes precious little luck to overcome such a slight edge—but you have to know where to find these bets before you can use them.

If you use this program to get experienced with craps you should be able to walk away from any craps table a winner. Once you know what bets to make and are able thereby to take the best advantage of lucky streaks, betting lightly to wait through the lean times, you'll have quite an edge.

This program uses the exact rules used at the MGM Grand Hotel in Las Vegas, so you'll be playing under actual gambling house conditions. You should be able not only to pay for the program, but also for your computer system the next time you go to Vegas or Atlantic City. \$7.95. Order no. 0015P.

Send me the following Instant Software:

Quantity	Catalog	Program name	Unit Cost	Total cost
			\$7.95	
			7.95	
			7.95	
			7.95	
			Shipping	\$1.00
			Total order	

Check Money Order VISA AMEX

MasterCharge Expiration date _____

Card No. _____

Name _____

Address _____

City _____ State _____ Zip _____

Instant Software Inc. Peterborough, NH 03458
Dept. K-1

Open House

This interactive search and sort program is designed to help real estate agencies find properties for customers. Though written in Wang BASIC, a few changes will adapt it to most other BASICs. A floppy-disk system would be helpful, but isn't required, to use the program.

ENTER THE LISTING NUMBER, IF KNOWN
KEY RETURN IF UNKNOWN

Display No. 1

Richard J. Nitto
1040 Pennsylvania Ave. R.D. #2
Binghamton NY 13903

ENTER THE DESIRED DISTRICT CODE # OR KEY RETURN TO SKIP
CODE # - DESCRIPTION
1 - CHENANGO BRIDGE, PORT DICK, HILLCREST, WHITNEY POINT,
CHENANGO, DICKINSON, FENTON, BARKER, LISLE, TRIANGLE
2 - TOWNS OF CONKLIN, KIRKWOOD, WINDSOR, & COLESVILLE
3 - CITY OF BINGHAMTON, TOWN OF BINGHAMTON
4 - JOHNSON CITY, WESTOVER, FAIRMONT PARK
5 - ENDWELL, ENDICOTT, TOWNS OF MAINE & NANTICOKE
6 - VESTAL
7 - VILLAGE OF OWEGO
8 - SUBURBAN TIoga COUNTY
9 - TIoga COUNTY SUBDIVISIONS
10 - CHENANGO COUNTY
11 - STATE OF PENNSYLVANIA
12 - MISCELLANEOUS

Display No. 2

ENTER THE DESIRED PROPERTY CODE # OR KEY RETURN TO SKIP
CODE # - DESCRIPTION
1 - RANCH
2 - CAPE COD
3 - TWO STORY
4 - SPLIT LEVEL
5 - SPLIT ENTRY
6 - MULTIPLE
7 - VACANT

Display No. 3

ENTER LOWER PRICE LIMIT IN THOUSANDS OR KEY RETURN TO SKIP

Display No. 4

ENTER UPPER PRICE LIMIT IN THOUSANDS OR KEY RETURN TO SKIP

Display No. 5

ENTER NUMBER OF BEDROOMS DESIRED OR KEY RETURN TO SKIP
ENTER NUMBER OF UNITS DESIRED OR KEY RETURN TO SKIP
ENTER NUMBER OF ACRES DESIRED OR KEY RETURN TO SKIP

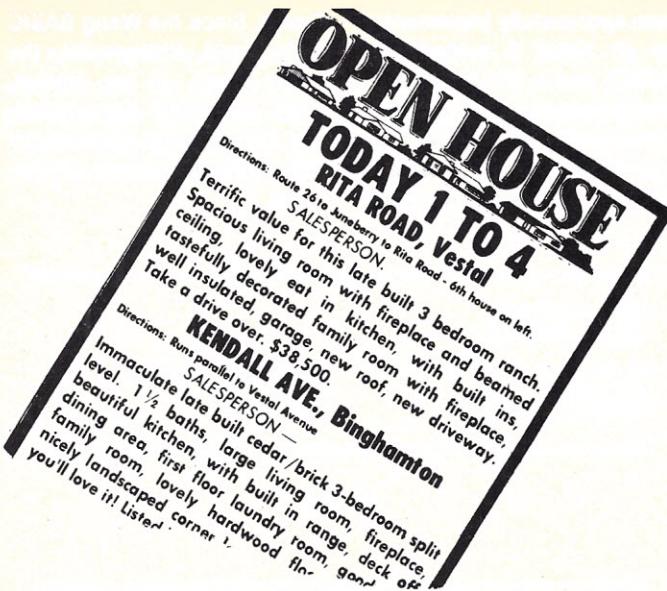
Display No. 6

Every week, prospective house-buyers look through hundreds of ads in hopes of finding a house that will meet their needs and can be purchased on their income. Sometimes, two or three ads look promising to a family, which spends its Sunday driving from site to site, looking at homes, one of which could end up being theirs. Should these visits not prove fruitful, the same basic ritual will probably be performed on subsequent weekends. After a few tiring Sundays such as these, the family may contact a friendly real estate salesman, probably one they've met at a previous open house and who, no doubt, has offered to spend his time helping the family find its dream house.

Since house-shopping, at its best, can be a very trying experience, it will benefit both the buyer and the real estate broker to make the looking process as short and as pleasant as possible.

Open House, as this program

Fig. 1. CRT display questions.



is called, is designed to do just that. It is a versatile program that narrows the search quickly and automatically and provides a list of properties that meet exactly the design criteria of the prospective customer.

Before they ever contact a realtor, most people have an idea of what they want in their house. They may like a particular style or desire a particular location. They may need a certain number of bedrooms. Perhaps they want a fireplace for those cold winter evenings or a game room for holiday parties. Maybe they even want a swimming pool for their growing children. In any case, the price range is usually well defined. At this point, a realtor can be of tremendous help.

Real estate brokers, agents and salesmen usually belong to multiple listing boards that provide their members with basic information and pictures of properties for sale in the surrounding area. In my area, the multiple listing books contain properties for sale divided into various categories such as residential, multiple unit dwellings, lots and acreage, commercial and farms. Each property, no matter which category it is in, is given a district number from one to 12 based upon its location.

Although the multiple listing service gives details on all properties, a realtor may still have to review a number of listings to find a house suiting his

customer's wants and needs, and in the end may not find a house, simply because it was somehow overlooked.

Open House is an interactive program that asks the buyer general questions about the desired property (see Fig. 1). Should there be no customer requirements in a particular category, that category is simply skipped by depressing the "Return" key.

When the questions have been completed, a printout of the proposed criteria and a listing of all properties meeting that criteria will be displayed or printed (see Figs. 2a-2f), and the agent can then call out additional details of these selected homes by entering their listing numbers (Figs. 2g-2j). Because numbers are the only required entries, the program is extremely easy to operate.

I purposely kept the program simple for this article, but it could easily be expanded to ask questions in other categories or provide as much detailed property information as desired. It is suited for disk storage because it is essentially an information retrieval system, but data-read statements can be utilized (as shown), provided sufficient memory is available.

Ideally, Open House could be administered by the multiple listing boards with participating brokers connected by time-sharing terminals or subscribing to weekly updated data

disks. Currently, the program is set up to be used on an individual basis by enterprising realtors; it displays only the properties listed by the realtor's own firm.

To illustrate the power of this program, I have shown some typical search and sort routines that Open House is able to perform (see Fig. 2 for output): (a) all three-bedroom Cape Cod homes under \$45,000; (b) all multiple dwellings under \$65,000; (c) all ranch homes in District No. 1 under \$40,000; (d) all vacant land over 1/2 acre under \$5000; (e) all multiple dwellings with four or more units; (f) all three-bedroom homes in District No. 2 between \$30,000 and \$40,000.

These, of course, are only a sample. Any combination of multiple category search and sort can be performed since this is not your usual "which is

larger (smaller)?" sort.

Data Orientation

The data used was taken from an actual local property listing book. Although all 12 districts were used in the original program, the data has been shortened to the first three districts to conserve article space. Each property listing utilizes two data statements as shown in Fig. 3.

If a property is sold, the two data statements pertaining to that property would be deleted; a new listing using the format in Fig. 3 can be placed anywhere in the program, since the search routine examines every listing sequentially anyway.

Hardware/Software

Although the program was initially designed to run on a Wang 2200 WCS with floppy disk, the search portion has

```
=====
PROPERTY CRITERIA
PROPERTY STYLE IS CAPE COD
UPPER PRICE LIMIT IS 45 THOUSAND
NUMBER OF BEDROOMS DESIRED IS 3
NO 5 DIST.NO 1 CAPE COD      3 BEDROOMS $39,000
VERY LARGE HOUSE
NO 11 DIST.NO 2 CAPE COD    3 BEDROOMS $22,000
TWO CAR GARAGE
NO 17 DIST.NO 2 CAPE COD    3 BEDROOMS $23,000
CARPORT, PATIO
NO 26 DIST.NO 1 CAPE COD    3 BEDROOMS $41,800
LOW TAXES
NO 37 DIST.NO 1 CAPE COD    3 BEDROOMS $34,500
CLOSE TO SCHOOLS
5 PROPERTIES FIT THE DESCRIPTION
=====
```

Fig. 2a.

```
=====
PROPERTY CRITERIA
PROPERTY STYLE IS MULTIPLE
UPPER PRICE LIMIT IS 65 THOUSAND
NO 28 DIST.NO 1 MULTIPLE     6 UNITS $62,500
ALL MASONRY
NO 29 DIST.NO 2 MULTIPLE     5 UNITS $48,000
MONEY MAKER
NO 32 DIST.NO 1 MULTIPLE     2 UNITS $38,900
LARGE
NO 33 DIST.NO 3 MULTIPLE     4 UNITS $24,000
HANDYMAN SPECIAL
NO 40 DIST.NO 1 MULTIPLE     4 UNITS $45,000
WILL FINANCE
5 PROPERTIES FIT THE DESCRIPTION
=====
```

Fig. 2b.



=====

PROPERTY CRITERIA
DISTRICT CODE # IS 1
PROPERTY STYLE IS RANCH
UPPER PRICE LIMIT IS 40 THOUSAND

NO 1 DIST.NO 1 RANCH	3 BEDROOMS	\$25,900
GAME ROOM		
NO 6 DIST.NO 1 RANCH	5 BEDROOMS	\$39,000
FIREPLACE AND GAME ROOM		
NO 10 DIST.NO 1 RANCH	2 BEDROOMS	\$21,500
HANDYMAN SPECIAL		

3 PROPERTIES FIT THE DESCRIPTION

=====

Fig. 2c.

been successfully implemented on an Apple II (w/Applesoft BASIC) and a SOL/North Star Disk/Selecterm system, both courtesy of The Computer Tree, Inc., a local computer store in Endwell NY headed by Dave Casler. Since the Wang BASIC is, no doubt, different than the many others on the market, some statement explanations may be necessary (see the program listing for statement numbers).

=====

PROPERTY CRITERIA
LISTING NUMBER IS 26

NO 26 DIST.NO 1 CAPE COD	3 BEDROOMS	\$41,800
LOW TAXES		
ADDRESS- HICKORY ROAD	TAXES-	\$450

=====

Fig. 2g.

=====

PROPERTY CRITERIA
PROPERTY STYLE IS VACANT
UPPER PRICE LIMIT IS 5 THOUSAND
NUMBER OF ACRES DESIRED IS .5

NO 30 DIST.NO 3 VACANT	1.50 ACRES	\$1,500
ALL UTILITIES		
NO 31 DIST.NO 2 VACANT	0.50 ACRES	\$4,500
NICE AREA		

2 PROPERTIES FIT THE DESCRIPTION

=====

Fig. 2d.

=====

PROPERTY CRITERIA
LISTING NUMBER IS 36

NO 36 DIST.NO 3 MULTIPLE	8 UNITS	\$74,000
FURNISHED UNITS		
ADDRESS- MAIN STREET	TAXES-	\$1,462

=====

Fig. 2h.

=====

PROPERTY CRITERIA
PROPERTY STYLE IS MULTIPLE
NUMBER OF UNITS DESIRED IS 4

NO 28 DIST.NO 1 MULTIPLE	6 UNITS	\$62,500
ALL MASONRY		
NO 29 DIST.NO 2 MULTIPLE	5 UNITS	\$48,000
MONEY MAKER		
NO 33 DIST.NO 3 MULTIPLE	4 UNITS	\$24,000
HANDYMAN SPECIAL		
NO 36 DIST.NO 3 MULTIPLE	8 UNITS	\$74,000
FURNISHED UNITS		
NO 40 DIST.NO 1 MULTIPLE	4 UNITS	\$45,000
WILL FINANCE		

5 PROPERTIES FIT THE DESCRIPTION

=====

Fig. 2e.

=====

PROPERTY CRITERIA
LISTING NUMBER IS 31

NO 31 DIST.NO 2 VACANT	0.50 ACRES	\$4,500
NICE AREA		
ADDRESS- ROUTE 79	TAXES-	\$147

=====

Fig. 2i.

=====

PROPERTY CRITERIA
LISTING NUMBER IS 46

LISTING NUMBER 46 NOT FOUND

=====

Fig. 2j.

Name	Type	Description
I	Input	Desired listing number
D	Input	Desired district code number
S	Input	Desired property code number
SS\$	Computed	Property description
L	Input	Lower price limit in thousands
H	Input	Upper price limit in thousands
R	Input	Number of bedrooms, units or acres
I1	Data	Actual listing number
D1	Data	Actual district code number
S1\$	Data	Actual property description
P	Data	Actual price
C1\$	Data	Actual property remark
C2\$	Data	Actual property address
C3	Data	Actual property taxes
X	Computed	Number of qualified listings
N	Temp	Number for underlining

Fig. 2f.

Variable descriptions.

Statement Explanations

Colons indicate multi-statement lines.

The Wang accepts a RETURN

as an acceptable input. The Apple II and possibly others can duplicate this by testing for the length of the input and branching if zero.

Line 140 Print hex (03) causes the CRT to clear and the cursor to home in the upper left-hand corner.

The ON statement in line 490

is a conditional GOTO statement. If S+1 equals the value one, branch to 580; if S+1 equals the value two, branch to 510; and so forth. With any value of S+1, the program executes statement 500.

PRINTUSING and the image statement % in lines 1150-1230 allow the designated parameters to be formatted in the printout. Print with tabs could be used to accomplish this task.

SELECT PRINT 005(64) in line 130 assigns the output to occur on the CRT; SELECT PRINT 215(93) in line 710 assigns printing to a hard-copy device. Change these to your system's method of output selection.

Using the program documentation (Fig. 4) and the detailed flowchart (Fig. 5) should enable even the weekend programmer to modify the program to his own version of BASIC.

Other Related Uses and Variations

The program could be revised to search for and display the realtor's own listings first and then search for other list-

(House Data)						
	Listing No.	Dist. No.	Prop. Code	Price	Bedrooms	Remarks
1660 DATA	16,	2,	"Ranch",	60000,	4,	"Wooded Privacy"
	Address		Taxes			
1670 DATA	"S.Morningside Drive",		1320			

(Multiple Data)						
	Listing No.	Dist. No.	Prop. Code	Price	Units	Remarks
1990 DATA	33,	3,	"Multiple",	24000,	4,	"Handyman Special"
	Address		Taxes			
2000 DATA	"Vine Street",		420			

(Vacant Land Data)						
	Listing No.	Dist. No.	Prop. Code	Price	Acreage	Remarks
2020 DATA	34,	2,	"Vacant",	3500,	0.25,	"Water and Sewer"
	Address		Taxes			
2030 DATA	"Willette Park",		104			

Fig. 3.

120-	Dimensions the Alphanumeric Variables.	710-	Selects the printer for output.
130-	Selects the CRT for display.	720-	Prints a line across page for outlining.
140-	Clears screen, homes cursor.	730- 850	Prints property criteria. If any of the input variables are zero, that particular criteria designation will not print.
150-	Sets counter to zero.	860- 870	Reads data statement I1 and checks for end of data indicator.
160- 190	Sets listing number to zero, displays first question and looks for input, checks if input is zero.	880-	Reads the rest of a particular property's data.
200-	Sets district code # to zero, clears screen, homes cursor.	890- 900	If listing number input equals data listing number branch to printout sequence. If not go to 860.
210- 350	Displays the optional code # and descriptions. This part of the program would be revised for your area.	920- 930	Reads data statement I1 and checks for end of data indicator.
360- 370	Looks for input of district code # and checks if within acceptable limits.	940-	Reads the rest of a particular property's data.
380-	Sets property code # and property description to zero and blank, clears screen, homes cursor.	950- 970	If input D = zero or equal to data D1 then goes to next input check; if not go to 920.
390- 470	Displays the optional property code # and descriptions.	980-1000	If criteria S\$ = a space or equal to data S1\$ then goes to next input check; if not go to 920.
480-	Looks for input of property code #.	1010-1030	If input H = zero or equal to or greater than data P then goes to next input check; if not go to 920.
490- 570	Determines if property code # is within acceptable limits. If OK sets variable S\$ to type of property desired.	1040-1060	If input L = zero or equal to or less than data P goes to next input check; if not go to 920.
580-	Sets lower and upper price limits to zero, clears screen, homes cursor.	1070-1120	If input R = zero or equal to data R1 in the case of houses, or equal to or less than data R1 in the case of multiple dwellings or vacant land then go to printout of data routine; if not go to 920.
590- 600	Displays question of lower price limit and looks for input.	1130-1330	Printout routine.
610- 620	Displays question of upper price limit and looks for input.	1340-1350	Place data pointer back to first data and return to beginning of program.
630-	Sets variable R to zero, clears screen, homes cursor.	1360-2170	DATA statements.
640- 700	Displays the last question which is dependent upon original input for S and looks for input.	2180-	End of data indicator.

Fig. 4. Program documentation.



ings if nothing suitable were found.

An agent can give a prospective seller an idea of what his house is worth on the market by displaying a list of similar homes and their asking prices.

An agent dealing in apartments and houses for rent could utilize this program, simply altered, to locate living quarters for people seeking places for rent instead of for sale. The questions would be changed, of course. A broker dealing in both sales and rentals could incorporate both into the same program with the initial question dealing with "Buy or Rent?"

In the February 1978 issue of *Kilobaud*, former Editor John Craig described a prototype graphics board from Vector Graphic, soon to be available, which could enable the computer to display digitized photos of the realtor's listings.

Conclusion

The real estate field up to now has had virtually no need for minicomputers, except for payroll and accounting. Why don't you get this program running and show it to a few realtors. The potential is there. Tap it. ■

Program listing.

```

100 REM - OPEN HOUSE - COPYRIGHT MARCH 1978 BY RICHARD J. NITTO
110 REM - A REAL ESTATE HOUSE SEARCH APPLICATION
120 DIM S$11,C1$64,C2$30
130 SELECT PRINT 005(64)
140 PRINT HEX(03)
150 X=0: REM - SET NUMBER OF QUALIFIED PROPERTIES TO ZERO
160 I=0:PRINT "ENTER THE LISTING NUMBER, IF KNOWN"
170 PRINT "KEY RETURN IF UNKNOWN"
180 INPUT I
190 IF I<>0 THEN 710: REM - DETAILS OF A PROPERTY ARE WANTED
200 D=0:PRINT HEX(03)
210 PRINT "ENTER THE DESIRED DISTRICT CODE # OR KEY RETURN TO SKIP"
220 PRINT "CODE # - DESCRIPTION"
230 PRINT " 1 - CHENANGO BRIDGE, PORT DICK, HILLCREST, WHITNEY POINT, CHENANGO, DICKINSON, FENTON, BARKER, LISLE, TRIANGLE"
240 PRINT " 2 - TOWNS OF CONKLIN, KIRKWOOD, WINDSOR, & COLESVILLE"
250 PRINT " 3 - CITY OF BINGHAMTON, TOWN OF BINGHAMTON"
260 PRINT " 4 - JOHNSON CITY, WESTOVER, FAIRMONT PARK"
270 PRINT " 5 - ENDWELL, ENDICOTT, TOWNS OF MAINE & NANTICOKE"
280 PRINT " 6 - VESTAL"
290 PRINT " 7 - VILLAGE OF OWEGO"
310 PRINT " 8 - SUBURBAN TIoga COUNTY"
320 PRINT " 9 - TIoga COUNTY SUBDIVISIONS"
330 PRINT " 10 - CHENANGO COUNTY"
340 PRINT " 11 - STATE OF PENNSYLVANIA"
350 PRINT " 12 - MISCELLANEOUS"
360 INPUT D
370 IF D<>0 THEN 200:IF D>12 THEN 200
380 S=0:S$="" :PRINT HEX(03)
390 PRINT "ENTER THE DESIRED PROPERTY CODE # OR KEY RETURN TO SKIP"
400 PRINT "CODE # - DESCRIPTION"
410 PRINT " 1 - RANCH"
420 PRINT " 2 - CAPE COD"
430 PRINT " 3 - TWO STORY"
440 PRINT " 4 - SPLIT LEVEL"
450 PRINT " 5 - SPLIT ENTRY"
460 PRINT " 6 - MULTIPLE"
470 PRINT " 7 - VACANT"
480 INPUT S
490 ON S+1 GOTO 580,510,520,530,540,550,560,570
500 GOTO 380
510 S$="RANCH":GOTO 580
520 S$="CAPE COD":GOTO 580
530 S$="TWO STORY":GOTO 580
540 S$="SPLIT LEVEL":GOTO 580
550 S$="SPLIT ENTRY":GOTO 580
560 S$="MULTIPLE":GOTO 580
570 S$="VACANT":GOTO 580
580 L=0:H=0:PRINT HEX(03)
590 PRINT "ENTER LOWER PRICE LIMIT IN THOUSANDS OR KEY RETURN TO SKIP"
600 INPUT L
610 PRINT "ENTER UPPER PRICE LIMIT IN THOUSANDS OR KEY RETURN TO SKIP"
620 INPUT H
630 R=0:PRINT HEX(03)
640 PRINT "ENTER NUMBER OF ";
650 ON S-5 GOTO 670,680
660 PRINT "BEDROOMS":GOTO 690
670 PRINT "UNITS":GOTO 690
680 PRINT "ACRES";
690 PRINT " DESIRED OR KEY RETURN TO SKIP"
700 INPUT R
710 SELECT PRINT 215(93)
720 FOR N=1TO 64:PRINT "=":NEXT N
730 PRINT :PRINT :PRINT "PROPERTY CRITERIA"
740 IF I=0 THEN 750:PRINT "LISTING NUMBER IS ";I:GOTO 850
750 IF D=0 THEN 760:PRINT "DISTRICT CODE # IS ";D
760 IF S$=" " THEN 770:PRINT "PROPERTY STYLE IS ";S$
```

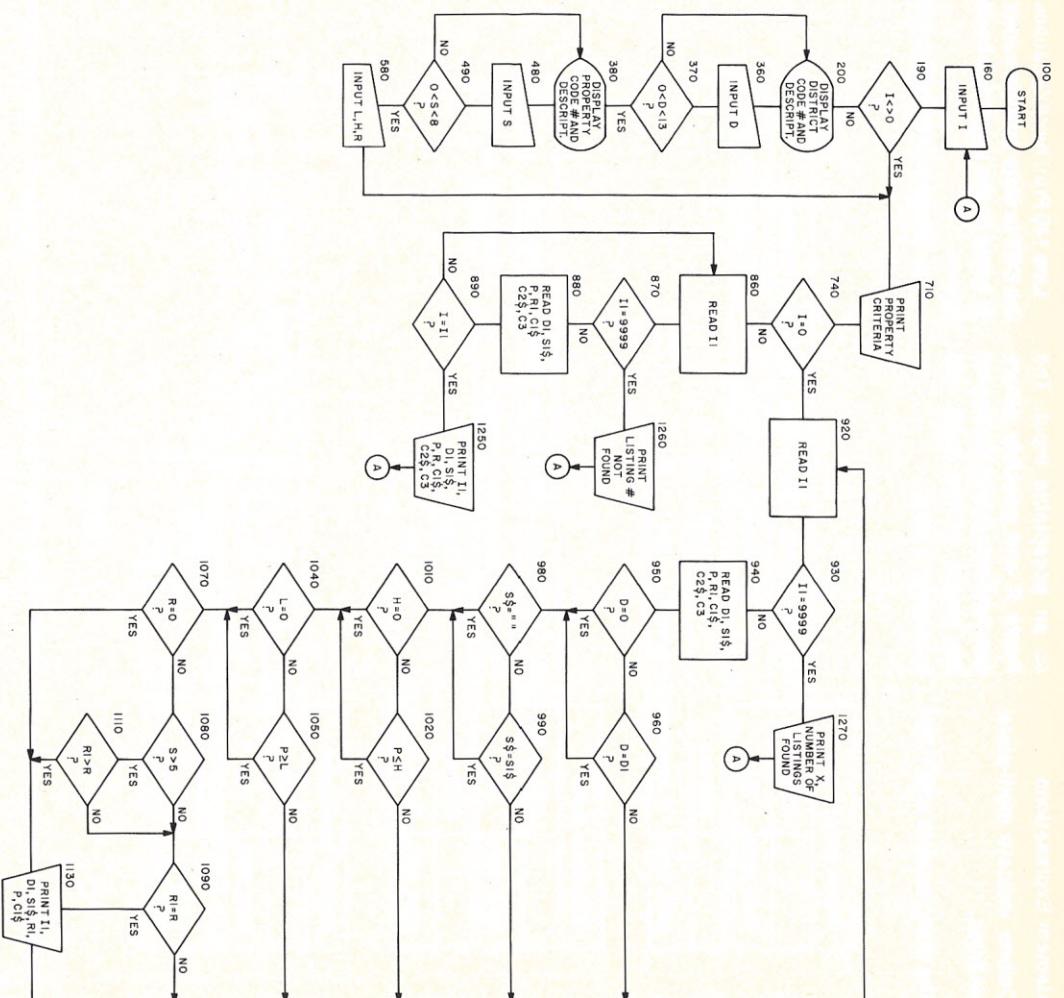


Fig. 5.

```

770 IF L=0 THEN 780:PRINT "LOWER PRICE LIMIT IS ";L;" THOUSAND"
780 IF H=0 THEN 790:PRINT "UPPER PRICE LIMIT IS ";H;" THOUSAND"
790 IF R=0 THEN 910:PRINT "NUMBER OF ";
800 ON S-5 GOTO 820,830
810 PRINT "BEDROOMS":GOTO 840
820 PRINT "UNITS":GOTO 840
830 PRINT "ACRES";
840 PRINT " DESIRED IS ";R:GOTO 910
850 PRINT
860 READ I1
870 IF I1=9999 THEN 1260
880 READ D1,S1$,P,R1,C1$,C2$,C3
890 IF I=I1 THEN 1250: REM - LISTING NUMBER FOUND
900 GOTO 860
910 PRINT
920 READ I1
930 IF I1=9999 THEN 1270
940 READ D1,S1$,P,R1,C1$,C2$,C3
950 IF D=0 THEN 980: REM - LOCATION DOESN'T MATTER
960 IF D=D1 THEN 980: REM - A MATCH
970 GOTO 920
980 IF S$=" " THEN 1010: REM - PROPERTY STYLE UNIMPORTANT
990 IF S$=S1$ THEN 1010: REM - A MATCH
1000 GOTO 920
1010 IF H=0 THEN 1040:REM - NO UPPER LIMIT ON PRICE
1020 IF P<=H*1000 THEN 1040:REM - PRICE WITHIN UPPER LIMIT
1030 GOTO 920
1040 IF L=0 THEN 1070:REM - NO LOWER LIMIT ON PRICE
1050 IF P>=L*1000 THEN 1070:REM - PRICE HIGHER THAN LOWER LIMIT
1060 GOTO 920
1070 IF R=0 THEN 1130: REM - NUMBER OF BEDROOMS,UNITS,OR ACRES DOESN'T MATTER
1080 IF S$=5 THEN 1110
1090 IF R1=R THEN 1130: REM - A MATCH
1100 GOTO 920
1110 IF R1>R THEN 1130: REM - A MATCH
1120 GOTO 1090
1130 GOSUB 1140:GOTO 910
1140 IF S1$="MULTIPLE" THEN 1180
1150 IF S1$="VACANT" THEN 1190
1160 PRINT USING 1200,I1,D1,S1$,R1,P
1170 PRINT USING 1230,C1$:X=X+1:RETURN
1180 PRINT USING 1210,I1,D1,S1$,R1,P:GOTO 1170
1190 PRINT USING 1220,I1,D1,S1$,R1,P:GOTO 1170
1200 ZNO ##### DIST.NO ## ##### BEDROOMS #####,#####
1210 ZNO ##### DIST.NO ## ##### UNITS #####,#####
1220 ZNO ##### DIST.NO ## ##### ACRES #####,#####
1230 ##### ADDRESS- ##### TAXES- $#,###
1240 ZADDRESS- ##### TAXES- $#,###
1250 GOSUB 1140:PRINT USING 1240,C2$,C3:GOTO 1330
1260 PRINT "LISTING NUMBER ";I;" NOT FOUND":GOTO 1330
1270 IF X=0 THEN 1300
1280 PRINT X:IF X=1 THEN 1310
1290 PRINT " PROPERTIES FIT":GOTO 1320
1300 PRINT "NO";
1310 PRINT " PROPERTY FITS";
1320 PRINT " THE DESCRIPTION"
1330 PRINT :FOR N=1TO 63:PRINT "=";:NEXT N:PRINT "="
1340 RESTORE
1350 GOTO 130
1360 DATA 1,1,"RANCH",25900,3,"GAME ROOM"
1370 DATA "TRAFFORD ROAD",350
1380 DATA 2,1,"CAPE COD",26000,2,"UPSTAIRS SEMI-FINISHED"
1390 DATA "MARSHMAN ROAD",548
1400 DATA 3,1,"TWO STORY",28900,4,"LARGE YARD"
1410 DATA "FORD HILL ROAD",446
1420 DATA 4,1,"SPLIT ENTRY",36200,4,"2 1/2 BATHS - LR AND DR ARE CARPETED"
1430 DATA "PAMELA DRIVE",554
1440 DATA 5,1,"CAPE COD",39000,3,"VERY LARGE HOUSE"
1450 DATA "RIVERVIEW ROAD",330
1460 DATA 6,1,"RANCH",39000,5,"FIREPLACE AND GAME ROOM"
1470 DATA "ARbutus LANE",450

```

```

1480 DATA 7,1,"RANCH",54000,4,"ADDITIONAL 4 ACRES AVAILABLE"
1490 DATA "BALLYHACK ROAD",540
1500 DATA 8,1,"RANCH",63000,4,"HEATED POOL AND GREENHOUSE"
1510 DATA "POPLAR HILL ROAD",1200
1520 DATA 9,1,"TWO STORY",78000,5,"TWO FIREPLACES, LARGE POOL"
1530 DATA "COLUMBINE DRIVE",1458
1540 DATA 10,1,"RANCH",21500,2,"HANDYMAN SPECIAL"
1550 DATA "CASTLE CREEK ROAD",300
1560 DATA 11,2,"CAPE COD",22000,3,"TWO CAR GARAGE"
1570 DATA "SANITARIA SPRINGS",347
1580 DATA 12,2,"TWO STORY",28900,3,"FENCED BACK YARD"
1590 DATA "MELODY LANE",546
1600 DATA 13,2,"RANCH",35000,3,"WORKSHOP OVER GARAGE"
1610 DATA "SUNRISE TERRACE",670
1620 DATA 14,2,"RANCH",40000,3,"COUNTRY KITCHEN"
1630 DATA "CONKLIN ROAD",800
1640 DATA 15,2,"SPLIT ENTRY",45000,4,"EXCELLENT VIEW OF CITY"
1650 DATA "ROUTE 7",860
1660 DATA 16,2,"RANCH",60000,4,"WOODED PRIVACY"
1670 DATA "S.MORNINGSIDE DRIVE",1320
1680 DATA 17,2,"CAPE COD",23000,3,"CARPORT, PATIO"
1690 DATA "DYER FLAT ROAD",860
1700 DATA 18,3,"TWO STORY",30000,3,"NEAR SHOPPING MALL"
1710 DATA "ROBINSON STREET",565
1720 DATA 19,3,"RANCH",37000,3,"RECREATION ROOM"
1730 DATA "GRAND BOULEVARD",708
1740 DATA 20,3,"SPLIT LEVEL",43000,4,"LARGE LANDSCAPED LOT"
1750 DATA "MACON STREET",650
1760 DATA 21,3,"RANCH",27500,3,"NEAR HIGH SCHOOL"
1770 DATA "RUGBY ROAD",500
1780 DATA 22,3,"SPLIT ENTRY",39500,3,"LARGE LIVING ROOM"
1790 DATA "MATTHEWS STREET",620
1800 DATA 23,3,"TWO STORY",44500,3,"NEAR MALL"
1810 DATA "RIVERSIDE DRIVE",910
1820 DATA 24,3,"RANCH",24500,3,"LARGE YARD"
1830 DATA "MAIN STREET",650
1840 DATA 25,2,"CAPE COD",43900,4,"AREA OF NICE HOMES"
1850 DATA "PIERCE CREEK ROAD",820
1860 DATA 26,1,"CAPE COD",41800,3,"LOW TAXES"
1870 DATA "HICKORY ROAD",450
1880 DATA 27,1,"SPLIT LEVEL",54000,4,"STONE FIREPLACE"
1890 DATA "CONKLIN FORKS ROAD",1147
1900 DATA 28,1,"MULTIPLE",62500,6,"ALL MASONRY"
1910 DATA "STRATMILL ROAD",1800
1920 DATA 29,2,"MULTIPLE",48000,5,"MONEY MAKER"
1930 DATA "BELDEN HILL",1210
1940 DATA 30,3,"VACANT",1500,1.5,"ALL UTILITIES"
1950 DATA "ATHAN STREET",84
1960 DATA 31,2,"VACANT",4500,0.5,"NICE AREA"
1970 DATA "ROUTE 79",147
1980 DATA 32,1,"MULTIPLE",38900,2,"LARGE"
1990 DATA "MOELLER STREET",622
2000 DATA 33,3,"MULTIPLE",24000,4,"HANDYMAN SPECIAL"
2010 DATA "VINE STREET",420
2020 DATA 34,2,"VACANT",3500,0.25,"WATER AND SEWER"
2030 DATA "WILLETTE PARK",104
2040 DATA 35,2,"SPLIT ENTRY",35000,3,"NICELY LANDSCAPED"
2050 DATA "CHENANGO STREET",872
2060 DATA 36,3,"MULTIPLE",74000,8,"FURNISHED UNITS"
2070 DATA "MAIN STREET",1462
2080 DATA 37,1,"CAPE COD",34500,3,"CLOSE TO SCHOOLS"
2090 DATA "MAPLEWOOD DRIVE",900
2100 DATA 38,3,"RANCH",44500,3,"NICE NEIGHBORHOOD"
2110 DATA "FENNSYLVANIA AVENUE",730
2120 DATA 39,2,"VACANT",8500,2,"VIEW OF CITY"
2130 DATA "UPPER BROAD AVENUE",246
2140 DATA 40,1,"MULTIPLE",45000,4,"WILL FINANCE"
2150 DATA "ROUTE 79",900
2160 DATA 41,1,"VACANT",85000,145,"PLANNED DEVELOPMENT DISTRICT"
2170 DATA "RIVER ROAD",550
2180 DATA 9999

```



Cassette Interfacing: a Multilingual Approach

In the babel of computerdom, the authors suggest building toward a language standard.

David C. Jenkins
Joseph A. McCauley
Teletek
11505B Douglas Road
Rancho Cordova CA 95670

It is no surprise that there are several problems in the microcomputer industry; it is one of the newest and fastest-moving industries in the world. One of the major problems the industry faces is a lack of a universal communication method, i.e., a common language. Although it may be highly improbable that anyone will ever develop the "perfect" language, it does appear that the problem deserves some thought.

In this article we will take a look at some of the "languages" used to communicate between the CPU and a cassette deck. We will also

describe a combination hardware/software partial solution to this problem (partial only because there is no total solution as of this writing).

CPU-to-Cassette-Deck Languages

A computer memory typically can hold one or two major programs, and yet a user may, at some time, want to use one of hundreds of programs. The problem then arises, where to store the programs prior to use in a form that is easy to recall and yet, for the cost-conscious hobbyist, is inexpensive. One solution to that problem is storage using the cassette tape recorder.

Using a cassette interface, you can store data serially one bit at a time on cassette tape where it forms a permanent record. This record can be

reread and played back into the computer at any time. The cassette tapes are inexpensive, and the performance is reasonably fast. A typical cassette tape recorder can store 500 kilobytes of data on one side of a 60 minute cassette. A typical error-free data transfer rate is 2500 baud, which is 312 bytes per second.

However, there is one glaring problem with cassette data storage. There are at least five popular and separate formats in which data are encoded on cassette tape used by numerous manufacturers. The problem the user faces is how to enable someone to be able to read data information into his computer regardless of his tape language. The five popular formats are: CUTS (used by Processor Technology Corporation), Kansas City, Tarbell biphase, Commodore PET and Radio Shack.

Three formats have become very popular for hobby use: CUTS, Kansas City and Tarbell. Let us define those three formats. (Note: We will discuss data format on tape, not the logical format of the files.)

Data Encoding

To define the three popular

formats, we should begin by considering the basic timing diagram outlined in Fig. 1. The top line of that figure is the basic clock frequency. (For our purposes, we will assume that the basic clock frequency is the same for the three methods of encoding, although in practice they will be different.)

The second line of the figure represents the data as they are shifted out of a shift register. Note that the data are shifted on the positive transition of the clock. Zeros are represented by a low level; ones are represented by a high level. As an example of basic data encoding, two hexadecimal bytes are sent to the tape recorder; these bytes are a 3C and an E6.

The third line of the diagram is labeled Biphase Tarbell. Here, note the data are exclusive ORed with the basic clock frequency and then sent to the tape recorder. In this biphase format, a low-frequency pulse indicates a change from a data bit zero to one or from a data bit one to zero. A high-frequency pulse means that the present data bit remains the same as the last data bit. With this method, data inversion is important; the data must be in the correct phase as they are read

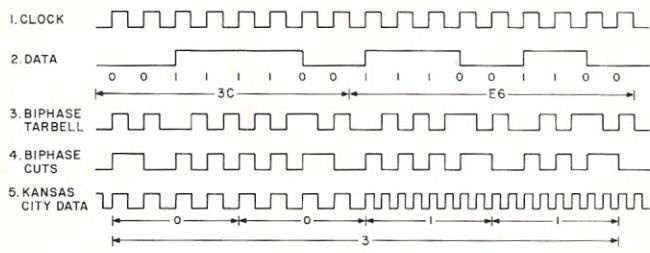


Fig. 1. Basic data encoding.

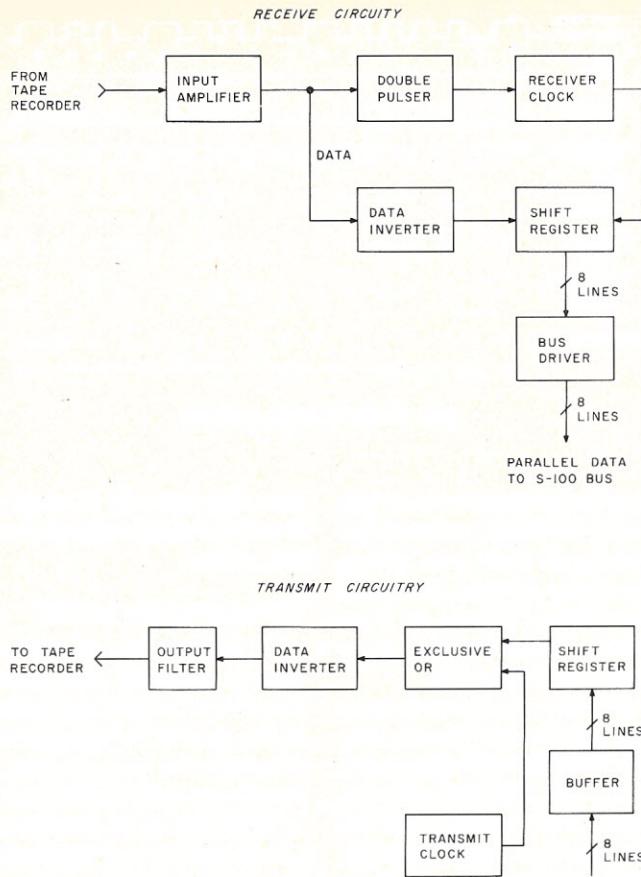


Fig. 2. UCRI simplified block diagram.

into the interface board or they will be incorrect.

Now look at the fourth line of Fig. 1, which is labeled Biphase CUTS. Note that data stored on the tape are represented by either a low-frequency pulse or a high-frequency pulse. A low frequency is always equal to a data bit zero, and a high frequency is always equal to a data bit one. With this method of biphase encoding, data inversion is not important; the data may be reversed coming from the cassette recorder and the interface will still recognize the correct data.

Now consider the Kansas City method of recording. A group of microcomputer manufacturers met in Kansas City and defined that standard as follows: Eight cycles of a 2400 Hz tone represent a data bit one; four cycles of a 1200 Hz tone represent a data bit zero. Kansas City is thus a frequency shift keying method similar to that used in telephone modems.

With Kansas City we are not worried about data inversion; however, it is limited in speed.

Even though the basic clock frequency is 2400 Hz, the information transfer rate can never exceed 300 baud. This is because each bit of data requires either eight cycles of a 2400 Hz tone (which equals 300 baud) or four cycles of a 1200 Hz tone (which is also 300 baud).

On line 5 of Fig. 1, the Kansas City data, there are four bits represented: two zeros followed by two ones. Note that each zero is four cycles of a lower frequency, while each one is eight cycles of a higher frequency.

In the two biphase methods of data encoding, 16 bits of information were transferred in the time required to transfer four bits of information in Kansas City. Thus, by their very nature, biphase tape-recording methods are a factor of four to eight times faster than Kansas City. This amount of time becomes important when large blocks of data such as a 16K byte program written in BASIC are handled.

With the CUTS method of recording, this program would re-

quire 150 seconds to load into the computer; with the Tarbell biphase method of recording (at Tarbell's standard speed of 1500 baud), this program would require 87 seconds to load, whereas with Kansas City this program would take 601 seconds to load—more than 10 minutes!

If we run the biphase methods of encoding at the same frequency as Kansas City (i.e., 2400 Hz), the time required to load the 16K byte program will reduce to 75 seconds for the CUTS method of encoding and to 55 seconds with the Tarbell biphase method of recording. Time notwithstanding, the problem for the user is how to load software when he has no choice of encoding format. Not all of the software will be in the Tarbell format, nor will all of it be in the CUTS or Kansas City formats.

Ideally the solution is for every manufacturer of software to write it in one standard format. However, that is not the case and probably won't be for a while; therefore, we need an interim solution.

One solution is to use an interface that can read the three formats and interpret them in software to read what is actually represented on the tape. To do this, we will use a Teletek UCRI (universal cassette recorder interface), which is basically a biphase Tarbell-encoding interface. We will describe software that can interpret what the UCRI reads from the tape to determine what data were actually represented.

The UCRI

First, let's describe the UCRI and its biphase function. Refer to Fig. 2, a simplified block diagram of the UCRI. This block diagram outlines those major areas of the interface that are required to convert parallel data from the computer into data that can be written to the tape recorder and, on the receive side, take the data from the tape recorder and convert it back to parallel data for the computer.

To understand the functioning of the UCRI, you must un-

derstand the method used to assemble data into a format compatible with the tape recorder. Parallel data from the computer are sent via the S-100 bus to the input buffer of the UCRI. From the buffer, they are loaded into an 8-bit shift register. The data are shifted out of this register and exclusive ORed with a transmit clock. The data, as they are shifted out of the register, are illustrated in line 2 of Fig. 1. Data are shifted on the positive edge of the clock.

As you can see, the first two data bits are zeros, followed by ones. The data, after being exclusive ORed, are represented in line 3. (In Fig. 3 the exclusive OR function is illustrated. When both inputs are zeros or both inputs are ones, the output of the exclusive OR gate is a zero. When one input is a one and the other is a zero, the output of the gate is a one.)

Now compare the clock and the data with the exclusive OR function to see how the biphase data are generated. Depending upon the tape recorder being used, the data from the exclusive OR gate may be sent through an inverter. (This compensates for some tape recorders' input amplifiers' inversion of signal.) The data then

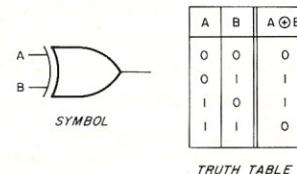


Fig. 3. Exclusive OR function.

pass through an output filter that suppresses the harmonics generated in the digital circuitry and are then fed to the tape recorder for recording onto tape.

Data Recovery

To understand the data recovery from the tape recorder, refer to Fig. 4, the first line of which represents the data as they are received from the tape recorder. The second line represents the actual data that were recorded onto the tape. (These

data are the same as those represented in Fig. 1.)

In Fig. 2, the data from the tape recorder are fed to an input amplifier where they are filtered and squared prior to insertion into the digital circuitry on board. The data then pass to a double pulser and to a data inverter. The output of the double pulser triggers an internal clock, which, when it has finished its timing sequence, clocks data into the shift register.

In Fig. 4, line 3, the output of the double pulser occurs every time the data change from a zero to a one or from a one to a zero. Look at line 4 of Fig. 4, which is the reconstructed clock. Prior to the first data change from a zero to a one on the receive data, the clock was not locked to the incoming data stream. After this initial change, the clock is locked and there is a regular clock generated, which is locked to the received data.

This self-clocking feature allows the tape speed to vary up to 33 percent without affecting the quality of the data. The clock period is set at precisely 75 percent of the duration of one data bit cell. (A bit cell is the time period in which a data bit is determined to be a one or a zero. For the biphase methods discussed here, the time is one cycle of the basic clock frequency.) When the clock returns to logic level zero, the data present at the output of the data inverter are shifted into the receiver/shift register.

Line 5 represents the data that are shifted to the register. These data are incorrect; they are not the actual data that

were on the tape. In line 6, we have caused the data inverter on board the UCRI to invert the data that were received from the recorder; in line 7, the data that are now shifted into the shift register are the actual data present on the tape.

Note that when there is a long pulse, the data will change in value from the previous data bit entered into the shift register; when there is a short pulse, the data remain the same. This is important when considering the software (described later) that will interpret other formats.

With a basic understanding of the functioning of the UCRI, we will now look at what happens when various formats other than biphase Tarbell are read from the tape recorder. First, the UCRI is set to 1200 baud, the standard CUTS transfer rate (refer to Fig. 5). The data from the recorder are represented on line 1, and the actual data that they represent are shown on line 2.

The UCRI double pulser synchronizes the receiver clock, which then clocks data into the UCRI shift register. Notice, in particular, those data that are shifted into the register. They bear slight resemblance to the actual data on tape. We must use the Tarbell biphase definition of data in our interpretation of what the shift register sees on the tape. Remember that for every long cycle of Tarbell biphase, the data change from a one to a zero or from a zero to a one.

In the CUTS encoding method, one long cycle represents a zero. Look at the data in the shift register and note every time they change. Whenever a

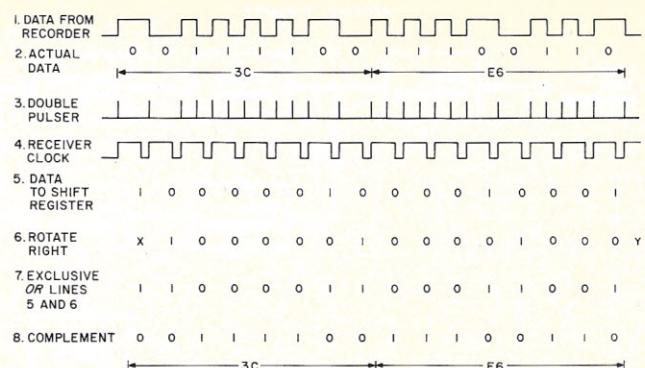


Fig. 5. CUTS data in UCRI.

data bit changes from a zero to one or vice versa, we know that there must have been a long data pulse on tape. Therefore, every change in data, as it applies to Tarbell biphase, is actually a CUTS zero bit.

Software can interpret these changes in data: take the data byte from the shift register and save it. Set the CPU carry flag from the bit shifted out of the last data byte. Get the new data again. Rotate the new data to the right, which rotates the old carry flag in and rotates the new carry flag out. Save the new carry flag. Exclusive OR these rotated data with the original data read in from the shift register and complement them.

Line 6 of Fig. 5 represents the rotated data. The "Y" on line 6 represents the data bit shifted out of the accumulator, which will be saved for the carry flag. The "X" represents the old data bit that was shifted out of the accumulator and is now shifted into the present data byte.

In line 7, exclusive OR the present shifted data with the data as they existed in the shift register. On line 8 we complement the data and see the result is the actual data as they occurred on the tape. In this figure we have used two bytes (16 bits) of data to clarify the process.

In the actual software, the rotating, exclusive OR and complementing will be done one byte at a time. We have changed the data that were in Tarbell biphase into the actual CUTS biphase data bytes. Note that this representation is independent of the phase of the

data. The data can be inverted or not; it makes no difference to this routine.

Kansas City Data in UCRI

To interpret Kansas City encoding, the UCRI clock must first be set for 2400 baud (refer to Fig. 6). Line 1 represents the data from the tape recorder in the Kansas City format. Line 2 is what the data represents. Line 3 again shows the double pulser of the UCRI, and line 4 shows the receiver clock response. Line 5 shows the data shifted into the UCRI shift register.

Note that the Kansas City zero appears to the UCRI to be alternating ones and zeros, while the Kansas City one appears to be all zeros. In actual practice, they may be all ones due to a data inversion in the tape recorder. The key here is that alternating ones and zeros represent a Kansas City zero, and when all the bits in the data byte from the UCRI are the same, they represent the Kansas City one.

The software that will interpret these data bits will first mask bits 2 through 5. This is done in case a noise pulse or a lost cycle of Kansas City causes the data to shift slightly. The data, after they are masked, are compared with either a 28 hex or a 14 hex when looking for a Kansas City zero. If neither of those comparisons is good, the bit is assumed to be a one.

One important feature of Tarbell biphase should be mentioned prior to the actual software interpretation of the data on the tape recorder. Tarbell bi-

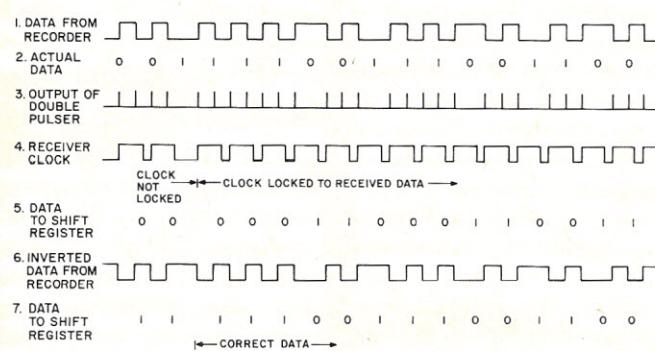


Fig. 4. Data recovery.

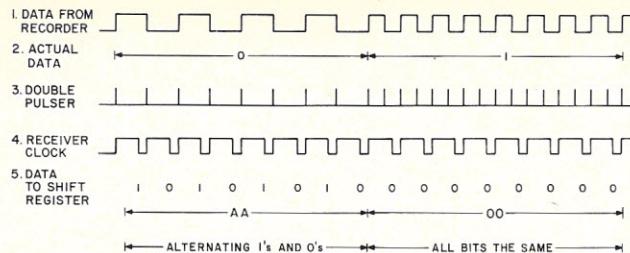


Fig. 6. Kansas City data in UCRI.

phase is a synchronous data transfer method. This means that each data byte is connected immediately to the last data; there are no intervening start or stop bits.

However, CUTS biphasic and Kansas City both add a start bit and two stop bits to each data

byte. Thus, there will be 11 data bits that must be interpreted for each data byte, while the UCRI will read in only eight bits at a time. The software must then keep track of the data byte that it sees in the UCRI and, additionally, reconstruct both start and stop bits with the data

byte in the software.

Wrap-up

As we have seen there is no simple solution to the data transfer problem and there is no interface board currently available that will interface all of the data transfer methods presently being used in S-100 systems. The most capable cassette interface, the Teletek UCRI, speaks three of the languages, Kansas City, CUTS and Tarbell biphasic, leaving the Commodore PET and Radio Shack users isolated and unable to communicate with other formats.

There is another possible remedy to the problem, which is

beyond the scope of this article: the use of one line of a parallel port for interpretation, disassembly of data bytes for the processor and the assembly and conversion to form those formats from processor data. This approach would emulate some of the system hardware outlined above to effectively solve our problems in a different manner.

The final solution to the problem is the development of a common language so that all users will have the ability to communicate and exchange information. That may be some time off, but we believe that the time is right for the industry to aim in that direction. ■

PUT YOUR MICRO TO WORK!

We offer quality software for business, educational and scientific needs. For example:

***GENERAL LEDGER:** 15 programs totalling almost 50K, including income statement-balance sheet, check register, custom account names, complete audit trails, and much, much, more. User oriented with manual. \$50.00.

We also have payroll, accounts payable, accounts receivable, multiple regression, grade book and others.

Check our documentation before you buy. Each manual is \$5.00 (credited towards purchase). All programs on diskette, and use North Star Basic, 8K of free memory 1 or 2 drives

Write for details

ECOSOFT

P.O. Box 68602
Indianapolis, IN 46208

✓E34

RS232C COMPUTER COMPATIBLE

paper tape transmitter/model 612



Stops and starts on character at all speeds, uses manual control or X-on, X-off 90-260 volt, 50-60 Hz power. 50-9600 baud, up to 150 character per sec synchronous or asynchronous; gated internal or external clock, RS 232C current loop or parallel output, reads 5-8 level tape, 7-11 frames per character, even or odd parity. Desk top or rack mount.



addmaster corporation
416 junipero serra drive
(213) 285-1121
san gabriel, ca 91776
telex 674770 addmaster sgab

✓A73

Pet® Games

1] **WORLD'S BEST STAR-TREK!** \$12.95
Klingons! Phaser (forward and rear)! Torps!
Bases! Stars! Hyperspace! Sensors! Thrills!
Chills! VICTORY! Defeat! Good ol' Scotty!
***** A Real-Time Real-Physics Game! *****

2] **BEAT THE MARKET!** \$12.95
Parley your stake into a million! Go wild with
your credit card! Sell short! Stick it in the bank!
Mideast war! Banks fail!! Go BANKRUPT!

3] **Arcade-style BLOCKADE!** \$12.95
Exciting Real-time action for two players! The
Famous Scientific American LIFE! BEAUTIFUL!
Uses the PET to its fullest advantage! Includes
super-convenient EDITOR!

BOUNCE! A Real-time missile deflection game
for one or [alternating] two.
All of the above come with QUEENIE!, Modified
(they breed like rabbits) KINGDOM, GIRL-KICKING-
CAT!! and Real-time PATTERNS!

GET THE WHOLE KABOODLE ON TWO
***** CASSETTES FOR \$24.95 *****

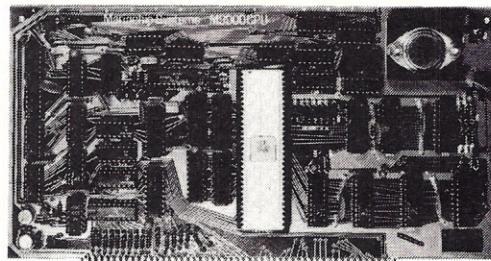
{ DAD'S }

RELIABLE SOFTWARE ✓D41
1614 NORMAN WAY MADISON WI. 53705
SATISFACTION OR YOUR MONEY BACK!

M9900 CPU-16 BIT MINI for the S-100 BUS with PASCAL

The M9900 CPU brings the most powerful single-chip processor available today—the TI TMS9900—to the S-100 bus and supports it with powerful software. Included with the CPU board are Disc Operating System, BASIC, Assembler, Linking Loader, Text Editor, and Interactive Debug. The powerful Pascal compiler is only \$150 more.

Move up to a 16 bit machine and the power of Pascal without losing the economy and selection of the S-100 bus — move up to the M9900 CPU.



Marinchip Systems

16 Saint Jude Road ✓M49
Mill Valley, Ca. 94941
(415) 383-1545

Kit \$550 Assembled \$700 Documentation \$20

PET Techniques Explained

Even Commodore will admit that the documentation accompanying many PETs has been rather scant. For those of you who want information on cassette files, read on.

The Commodore PET personal computer has a tape cassette unit that may be used for storage of programs and data. This article explains the basic concepts used to store and retrieve data with the PET and also illustrates some of the hazards (and how to avoid them) likely to be encountered by the novice user.

Getting Started

The first thing that is required is a PET and some suitable tapes. Note that the PET does not use "data" cassettes, such as those used for other types of cassette storage units. Ordinary medium-to-high-quality audio cassettes are used. Cassettes for your audio system are suitable for the PET. Seven or eight blank tapes will be sufficient.

If you want to use the examples that follow, please follow the directions *exactly*. If you take shortcuts, you will usually run head-on into one or another error.

Fig. 1 shows the PET BASIC statements that pertain to data files.

First of all, let's create a data tape. Type in the following program and then RUN it.

```
10 OPEN 1,1,1
20 FOR J = 1 TO 10
30 INPUT #1,X
40 PRINT X
50 NEXT J
60 CLOSE 1
```

Line 10 opens a data file. The logical file number is 1; the tape

drive number is 1; and the I/O option is to write (1). Line 30 does the actual writing on the tape. (Note: Be sure to spell out the word PRINT. Don't use the symbol ? for PRINT—it will leave you with a syntax error in 30). Line 50 closes the file, causing any characters left in the tape buffer to be written onto the tape. (You may want to save this program before using it. If you do so, title it PGM 1.)

When this program is RUN, the PET will give the message:

PRESS PLAY & RECORD ON TAPE #1

When you do so, PET will respond with:

OK

And when the program is finished, 'READY.' will appear. Rewind your data cassette and label it DATA 1.

Reading the tape is accomplished with this program.

```
10 OPEN 1
20 FOR J = 1 TO 10
30 INPUT #1,X
40 PRINT X
50 NEXT J
60 CLOSE 1
```

Line 10 opens the file with logical file number 1, and default values of 1 for the tape unit and 0 (read) for the I/O option. Line 30 reads the number on the tape into variable X, and line 40 displays it on the screen.

When you RUN this program, the following should appear on your PET screen.

RUN

PRESS PLAY ON TAPE #1

```
OK
1
2
3
4
5
6
7
8
9
10
```

READY.

If you cannot get this result, be sure that (1) your programs are *exactly* as shown, (2) you have completely rewound the data tape and (3) your recorder's heads are clean. Take another blank tape and save this program as PGM 2.

To illustrate the storage of strings, change PGM 1 and PGM 2 as follows:

PGM 1 30 PRINT#1,"I AM A PET"

PGM 2 30 INPUT#1,X\$
40 PRINT X\$

If you go through the steps mentioned above when you run PGM 2, your PET screen should show:

RUN

PRESS PLAY ON TAPE #1

```
OK
I AM A PET
```

READY.

Save this data tape as DATA 2.

The third thing to do is very

similar, that is, mixing strings and numbers. Take the original PGM 1 and PGM 2 and make these changes:

PGM 1 35 PRINT#1,"I AM A PET"

PGM 2 35 INPUT#1, X\$
45 PRINT X\$

Remember that the original lines 30 and 40 are still present this time. Your PET screen should now look like (after running both programs):

PRESS PLAY ON TAPE #1

```
OK
1
I AM A PET
2
I AM A PET
3
I AM A PET
4
I AM A PET
5
I AM A PET
6
I AM A PET
7
I AM A PET
8
I AM A PET
9
I AM A PET
10
I AM A PET
```

READY.

Save this tape as DATA 3. The purpose of the above examples was to simply show that PET cassette files *do* work.

Some Common Pitfalls

It is, unfortunately, very easy to make errors when working with the PET tape files. Sometimes you will get a syntax error, and other times the PET will "go away" and you will have to

turn off the power and start all over again. Be sure that you have the tapes mentioned in the preceding section.

The "?#" goof. Take PGM 1 and change line 30 by substituting the ? for the

PRINT:
30 ?#1, J

When you run this program, you will see:

?SYNTAX ERROR IN 30

Now, do a LIST 30:

30 PRINT#1, J

Now, why won't that work??? It certainly looks OK. . . .

The secret is that PET BASIC compresses its keywords to one-byte tokens, and expands these when it does the LIST command. The tokens for PRINT and PRINT# are different. Suppose that the tokens are:

For ? and PRINT *
For PRINT# @

When you type in:

30 PRINT J
30 PRINT#1, J
30 ?#1, J

it becomes:

30* J
30@1, J
30*#1, J

When BASIC looks at the line 30*#1, J, it assumes that the # is the first variable in the variable list, instead of the logical file number! The tokens * and @ mean very different things to BASIC.

When BASIC does the LIST, it does not care what comes after the keyword. You may have noticed that it is possible to create nonsense programs and LIST them, provided you don't try to run them. BASIC does not check a program line until the line is executed. In any case, the rule is very simple: Always spell out "PRINT" in PRINT#.

The , or ; disaster. Take PGM 1 and change line 30 to:

30 PRINT#1, J;

and run it. Then load PGM 2 and you should see:

(Use another blank tape for "scratch" data)
PRESS PLAY ON TAPE #1
OK
1.23456789E + 11

and then, the tape just keeps on going, and going, and ----. When

the Stop key is pressed, you will get:

BREAK IN 8224
READY.

If you try a LIST, the screen fills with many pi (π) symbols, and you have to turn off the power and restart the PET. (Note: This is a little unpredictable, but the general result is the same. . . .)

The best way to see what has happened is to again load PGM 1 and make line 30 not refer to a file (also, remove lines 10 and 50):

30 PRINT J;

You will see a line of numbers on the PET screen:

RUN
1 2 3 4 5 6 7 8 9 10
READY.

Now, change this little program:

30 INPUT X
35 PRINT X

and run it. When the ? appears for input, type in exactly the same line as was printed above (or, just move the cursor into the line if it is still on the screen). You will see the number 1.23456789E + 10.

What has happened is that the INPUT statement does not see blanks at all, and it absorbs all the digits into one number. The solution is to separate the numbers with commas or carriage returns. If you use commas, you will likely discover the next error.

The no carriage-return disaster. Using PGM 1 again, change line 30 to:

30 PRINT#1,J;" ;

and run it and PGM 2. Everything will proceed normally until a "1" appears on the PET screen. The tape will then keep on turning and will never stop. When you LIST, you will discover that the PET has crashed again. This time, the first time INPUT# was used, it read all the data on the tape. The second time (J = 2), INPUT# then caused the tape to try and locate another data block. Since there was none, the PET got confused.

The cure to all this is to be sure a carriage return is at the end of each item or group of items read by an INPUT#. Also note that PGM 2 should have been modified to read all ten

OPEN (Logical File Number), (Physical Device Number), (I/O Option), (Filename)
OPEN and the Logical File Number are always required. The other parameters are optional. If they are not specified, a default value is used.

Logical File Number The CLOSE, PRINT, INPUT and GET statements refer to this number to identify which file is being referenced. The value of this number can be from 1 to 255. Up to 10 files may be open at the same time. (If you OPEN to an illegal value, you will get a syntax or illegal quantity error. If you open more than 10 files, your PET will hang up and you will have to turn off the power.)

Physical Device Number This is either 1 or 2, with the default being 1. Number 1 is the cassette mounted in the PET, and number 2 is the auxiliary cassette, which is connected to the PET in the rear and is available from Commodore. Other Device numbers refer to other devices, including the keyboard, CRT and the IEEE-488 bus.

I/O Option Three values are allowed, 0, 1 and 2. The default is 0, which is to read the file. 1 and 2 are for writing. If you use option 2, an "end of tape" marker is written after the file is closed.

Filename This is a string or string variable that identifies the file. Though it can be very long, note that: (1) The default is a null string, which means "anything." (2) Only the first 16 characters are used for identification and (3) If your filename matches the first characters of a longer name, the PET will have "found" the file. (For example, if you open "CAN" and "CANADA" is on the tape, the PET will think that "CANADA" is the correct file.)

If you want to use a parameter which is optional, the preceding parameters must be supplied, even though you are using the default values.

Examples	Legal	Illegal
OPEN 1	OPEN,1	
OPEN 23,1,	OPEN 23,1,1	OPEN 23,10,1
OPEN 5,2,0,"SHAZAM"		OPEN 5,2,"SHAZAM"
OPEN 3,1,F\$		OPEN F\$

CLOSE (Logical File Number)

This closes the file referred to by the Logical File Number. If the file was being written, this forces any characters remaining in the buffer to be written to the tape. If the file was originally opened with I/O Option 2, an "end of tape" marker is also written to the tape.

PRINT# (Logical File Number), (Variable List)

This writes onto the file an exact copy of the characters output by an equivalent PRINT statement. This includes graphics, cursor movement, upper/lowercase and carriage-return characters. Care must be taken to ensure that the characters actually written to a file are acceptable by an INPUT# or GET# statement. Note: The form ?# will not work, even though it will LIST as PRINT#. This is explained in the article.

INPUT# (Logical File Number), (Variable List)

The characters on the tape are read in exactly the same way the INPUT statement takes characters from the keyboard. All of the limitations of normal INPUT apply to INPUT#. This includes using carriage return and commas to separate numbers, quotation marks to separate strings, and a maximum of 79 characters for any INPUT statement. (If you INPUT# with more than 79 characters on the tape without a carriage return, PET will crash or lose the data. The best approach to this is to PRINT# each item separately to include a carriage return after each variable stored on the tape.)

GET# (Logical File Number), (Variable)

This reads one character from the tape in exactly the same way that GET reads characters from the keyboard. It is not suggested that you use GET# with a numeric variable!

The 79-character limitation does not apply to GET#. However, be sure of what you are doing!

ST Status Word

This is a special BASIC variable that is set after each I/O operation. Bits are set according to the appropriate I/O conditions that are detected. The BASIC AND operator can be used to determine which bits have been set. The AND masks and conditions are:

4—Short Block. When the tape is being read, the block delimiter known as "shorts" is detected instead of data. This might happen if a short program were read as data.

8—Long Block. After a buffer full of data was read from the tape, the delimiter ("shorts") was not found. This could happen if a long program were read as data.

16—Unrecoverable Read Error. More than 31 errors were found when the data was being read . . . or two errors in the same place in both copies of the data record (PET records the data in each block twice). BASIC will stop with an error message.

32—Checksum Error. Checksums are used at the end of each block for both programs and data. If the sum computed from the data read does not match that given from the file, this bit is set.

64—End of File. When the end-of-file marker is encountered, this bit is set. Note: Checking this bit is the only way to detect an end-of-file directly. It is suggested you use a flag in the data, or know exactly how much data is on the tape when you read it.

128—End of Tape. An "End-of-Tape" marker was found before the file being searched for was found. BASIC will stop with an error message.

Example: To detect an end of file, use a statement similar to:

1000 IF (ST) AND 64 THEN PRINT "END OF FILE"

Fig. 1. PET BASIC file statements.

data items in the INPUT# statement. To make all this work, try PGM 1 and PGM 2 with these changes:

```
PGM 1 30 PRINT#1,J,"";
45 PRINT#1
PGM 2 delete 20 and 50
30 INPUT#1,A,B,C,D,E,F,G,H,I;J
40 PRINT A;B;C;D;E;F;G;H;I;J
```

Sure enough, it works!

```
PRESS PLAY ON TAPE #
OK
1 2 3 4 5 6 7 8 9 10
READY.
```

The over-80-characters hang-up. If more than 79 characters without a carriage return are written onto a tape, INPUT# will fail. (So will INPUT in normal use if you care to check it out.) Take PGM 1 and PGM 2 and try this combination:

```
PGM 1 30 PRINT#1,"ABCDEFGHIJ";
PGM 2 delete 20 and 50
30 INPUT#1, X$
40 PRINT X$
```

The result is shown in Example 1.

When PGM 1 ran, it wrote 100 characters onto the tape. Yet PGM 2 only read 80 of them! In other cases, PET will crash instead (the PET crashed a little while later—always turn off the power if you suspect this kind of error). The rule to follow is: *Always be sure there is a carriage return within each 80 characters of your data tape if you plan to read it with INPUT#.*

How to Avoid the Pitfalls

By now you may have noticed two fundamental charac-

teristics of PET's data tapes.

1. PRINT# writes the *same* characters onto a tape as an equivalent PRINT would have done onto the PET screen.
2. INPUT# expects the *same* characters from the tape as an equivalent INPUT would have from the PET keyboard.

Since PRINT does not include commas between its variables, some care must be taken to ensure that the characters written to the tape will be understood correctly by the INPUT statement. If you fail to take care of this, the penalty is lost data in the lucky case, and a PET crash otherwise. Take heed!

Long Data Files

The preceding examples have always created a tape with fewer than 191 characters on it. This was done deliberately to avoid introducing a complicating factor that will now be illustrated. When the PET writes a long data file, it will often be impossible to read the file back again unless some precautions are taken. (This is an operating system error that Commodore plans to fix someday. However, the fix shown below will work regardless.)

Take PGM 1 and PGM 2 and change line 20 in *both* of them to:

```
20 FOR J = 1 TO 1000
```

When you run PGM 1, notice

that the cassette drive turns the tape on and off, pausing at about 7-second intervals. Each time 191 characters are written to the tape, the tape is advanced one block and the characters recorded. The tape drive waits until there are 191 characters for writing.

Now, run your PGM 2 and watch carefully! The numbers 1 to 1000 will roll up the screen, with pauses while the tape turns on and reads the next data block. With my PET, I noticed that there was something amiss... the display looked like this:

```
48
49
50
99
100
101
etc.
```

The numbers 51 through 98 were missing! Also missing were 137-175, 213-251 and so forth. (Your PET may miss different groups of numbers, but the result is the same—PET misses tape blocks when reading from the tape.)

The exact problem has been found out by Commodore, and is beyond the scope of this article. However, a simple "fix" has been found. The way it works is to count the characters being written to the tape, and when more than 191 characters are counted, to turn the tape motor on for a short time, increasing the space between data blocks on the tape.

To verify that the tape is written on after 191 characters are output, try this program.

```
10 OPEN 1,1,1
20 GET A$ : IF A$ = "" THEN 20
30 J = J + 1
40 PRINT J
50 PRINT #1,"X";
60 GO TO 20
```

(" " is a null string)

Using a scratch tape, run this program and press keys until you see 190 on the screen. The tape ran for a while when the OPEN statement was executed (this wrote the tape header) and was still while you pressed the keys. When you press again, 191 appears, and the tape remains still. When you press again, 192 appears, and the tape now runs. This means that

a block is written to the tape after 191 characters have been printed.

Turning the cassette motor on and off is done via the two "black magic" statements. (in Example 2). (These manipulate some PET I/O registers.)

To see how this works, here is the "PET Maytag Program" for your enjoyment.

```
10 OPEN 1,1,1
20 POKE 59411,53
30 FOR J = 1 TO 1000: NEXT J
40 POKE 59411,61
50 FOR J = 1 TO 1000: NEXT J
60 GOTO 20
```

Do not put a cassette in the player, and just press "play" when asked to "PRESS PLAY AND RECORD." After a few seconds, the cassette motor will turn on and off every two seconds or so. Those of you with the second cassette unit are invited to make the appropriate changes and try it out on your second cassette.

The Fix

Here is PGM 1 modified to write 1000 numbers with a 10 "Jiffy" motor pulse between tape blocks. Subroutine 1000 is given the number of characters (L) written onto the tape. It checks to see if the total number (CH) is larger than the block size or 191 characters. If the tape has written a block, the motor is turned on for 10/60th of a second, or 10 "jiffies," and then turned off. The total number of characters is updated to show the number in the current block to be written. When this program is used to make a data tape, the previous version of PGM 2 reads all 1000 numbers perfectly.

```
5 REM—FIXED VERSION OF PGM 1
10 OPEN 1,1,1
20 FOR J = 1 TO 1000
30 PRINT #1, J
35 L = LEN(STR$(J)) + 1
36 GOSUB 1000
40 NEXT J
50 CLOSE 1
60 END
1000 REM CASSETTE FIX
1010 CH = CH + L
1020 IF CH < 192 THEN RETURN
1030 TA = TI
1040 POKE 59411,53
1050 IF TI-TA < 10 THEN 1050
1060 POKE 59411,61
1070 CH = CH - 191
1080 RETURN
```

Two things should be noticed. Line 35 computes the

```
PRESS PLAY ON TAPE #
OK
ABCDEFGHIJABCDEFGHIJABCDEFGHIJ
ABCDEFGHIJABCDEFGHIJABCDEFGHIJ
READY.
```

Example 1.

Normal PET Cassette

Turn ON POKE 59411,53
Turn OFF POKE 59411,61

PET Second Cassette

Turn ON POKE 59456, PEEK(59456)OR 16
Turn OFF POKE 59456, PEEK(59456)AND 239

(Remember that the second cassette is Physical Device # 2.)

Example 2.

```

RUN
BIG BROTHER PROGRAM
SUBJECT'S NAME? BILLY BYTE

PRESS PLAY & RECORD ON TAPE #1
OK
'EXIT' WHEN DONE
? BILLY IS A FINE BOY
? EXIT

SUBJECT'S NAME? JOHN RAM
'EXIT' WHEN DONE
? JOHN IS FORGETFUL
? EXIT

SUBJECT'S NAME? MRS CPU
'EXIT' WHEN DONE
? HAS NICE EYES
? EXIT

SUBJECT'S NAME? QUIT
READY.

```

Fig. 2. Sample run.

length of the number written to the tape and the carriage return. Line 1050 is a delay loop using the BASIC timing variable, TI, which counts in 1/60 second intervals.

Using File Names

If you want to put more than one file on a tape or want to use different files for different purposes, the file name lets you tell one file from another.

When the PET opens a file for writing, it puts the file name in the header record (which is written when the OPEN statement is executed). If there was data originally on the tape, the PET will ignore this and write over it.

When the PET opens a file for reading, it reads the header record and compares it with the file name it was told to search for. If the first characters in the name from the tape match the expected name, the PET then reads the file. If not, the PET will search for another header record. Warning: If you plan to have more than one file on a tape, be sure you will read them only. Writing a file between others is hazardous and likely to destroy any following files. It is also difficult to position the tape at the right point.

Here is a somewhat contrived example for multiple files.

```

10 REM CONTRIVED EXAMPLE
20 PRINT "BIG BROTHER PROGRAM"
30 INPUT "SUBJECT'S NAME";N$ 
40 IF N$ = "QUIT" THEN END

```

```

50 OPEN 1,1,1,N$ 
60 PRINT "EXIT" WHEN DONE"
70 INPUT D$ 
80 IF D$ = "EXIT" THEN 110
90 PRINT #1,D$ 
100 GOTO 70
110 CLOSE 1
120 PRINT
130 GOTO 30

```

The subject's name, N\$, is used for the file name. Strings are written onto the file until you enter EXIT. Then the program closes the file and asks for another subject's name. The result is a series of files, one for each subject. Note that if you enter more than a few lines of data, the PET will require the "Jiffy fix" mentioned in the previous section. A sample run of this program is shown in Fig. 2.

Notice that if you have already pressed PLAY & RECORD on the tape unit, the PET will not ask you to do it again. This "convenience" is sometimes a hazard. For example, if you have to rewind a tape, and forget to do it before running your program, you will have to stop the program and start over. The program to read the contrived example's data tape is shown in Fig. 3.

Notice that in line 50 you must include all the parameters in the OPEN statement. In line 70, the semicolon is not required between the quote mark and N\$. PET BASIC permits this provided it is clear what the variables are. Line 90 checks the I/O status variable, ST, for any unusual condition (in this case, the intention is to find the end of file); if any is found, the program closes the file and asks for the next name. When using ST in this way, the test must be done *immediately* after the I/O operation. When run, the PET screen will look like this:

```

RUN
BIG BROTHER'S BROTHER PGM
SUBJECT'S NAME? JOHN RAM

PRESS PLAY ON TAPE #1
OK

```

THE SCOOP ON JOHN RAM
JOHN IS FORGETFUL

SUBJECT'S NAME

Notice that the first file, "BILLY BYTE," was ignored, and the PET found the second file, "JOHN RAM." Naturally you will have to rewind the tape if you want to find a file you have

already read past.

Try it again, using "BILL" as the subject's name.

```

RUN
BIG BROTHER'S BROTHER PGM
SUBJECT'S NAME? BILL

PRESS PLAY ON TAPE #1
OK

```

THE SCOOP ON BILL
BILLY IS A FINE BOY

SUBJECT'S NAME?

PET found the file "BILLY BYTE," which matched "BILL" in the first characters. This illustrates that some caution is required in choosing file names so that their names do not fit inside each other.

Using GET# with Files

The GET# statement comes

in two flavors: one for numeric variables, and the other for strings. GET# with numeric variables is very difficult to use because it permits only the characters 0-9, +, -, ., E and space. Try the following program and you will find out that illegal characters give syntax errors, without any indication of why.

```
10 GET X : PRINT X;; GOTO 10
```

For this reason, only GET# for strings will be discussed.

First of all, GET# may be used to read any data on a file in string form. Here is a program that reads any tape and displays its contents.

```

10 OPEN 1
20 GET#1,A$
```

```

10 REM-TAPE TRACER
20 REM BY GREGORY YOB APRIL 1978
30 REM AVAILABLE FROM:
40 REM MIND'S EYE PERSONAL SOFTWARE
50 REM PO BOX 354, PALO ALTO, CA 94301
60 PRINT "TAPE TRACER" (the symbol is clear screen)
70 PRINT
80 PRINT "PUT YOUR DATA TAPE IN TAPE#1 AND"
90 PRINT "REWIND IT."
100 PRINT "PRESS ANY KEY WHEN YOU ARE READY"
110 GET A$ : IF A$ = "" THEN 110 ("" is a null string)
120 OPEN 1
130 PRINT " "; (clear screen again)
140 B = B + 1
150 PRINT "BLOCK NUMBER : ";B
160 PRINT
170 FOR J = 1 TO 191
180 GET#1,X$ 
190 IF ST > 0 THEN 500
200 IF ASC(X$) = 13 THEN PRINT "RX"; (Rvs ON, Shift-V, Rvs OFF)
210 PRINT X$;
220 NEXT J
230 PRINT:PRINT:PRINT
240 PRINT "MORE? ";
250 GET A$ : IF A$ = "" THEN 250 (null string again)
260 IF A$ <> "N" THEN PRINT : GOTO 140
270 CLOSE 1
280 END
500 PRINT:PRINT:PRINT:STATUS WORD : "ST:PRINT
510 IF(ST)AND 4 THEN PRINT "SHORT BLOCK
520 IF(ST)AND 8 THEN PRINT "LONG BLOCK
530 IF(ST)AND 16 THEN PRINT "READ ERROR
540 IF(ST)AND 32 THEN PRINT "CHECKSUM ERROR
550 IF(ST)AND 64 THEN PRINT "END OF FILE
560 IF(ST)AND 128 THEN PRINT "END OF TAPE
570 END

```

Note that a trailing quotation mark is not needed at the end of a PRINT statement.

When this program is run using DATA 1, the PET screen should show (Note: X is used to show the shift-V graphics character):

```

First,
TAPE TRACER
PUT YOUR DATA TAPE IN TAPE# 1 AND REWIND IT.
PRESS ANY KEY WHEN YOU ARE READY
PRESS PLAY ON TAPE #1
Then,
BLOCK NUMBER : 1
1X 2X 3X 4X 5X 6X 7X 8X 9X 10X 11X 12X
13X 14X 15X 16X 17X 18X 19X 20X 21X 22X
23X 24X 25X 26X 27X 28X 29X 30X 31X 32X
33X 34X 35X 36X 37X 38X 39X 40X 41X 42X
43X 44X 45X 46X 47X 48X 49X 50X
MORE?

```

If the data tape with the 1000 numbers on it is used, you will see:

```

BLOCK NUMBER : 1
1X 2X 3X 4X 5X 6X 7X 8X 9X 10X 11X 12X
13X 14X 15X 16X 17X 18X 19X 20X 21X 22X
23X 24X 25X 26X 27X 28X 29X 30X 31X 32X
33X 34X 35X 36X 37X 38X 39X 40X 41X 42X
43X 44X 45X 46X 47X 48X 49X 50X
MORE?

```

If you press any key except "N", you will then see the next block of numbers and so on. Try this program with your other data tapes.

Program listing.

30 PRINT A\$;
40 GOTO 20

Try it with the DATA 1 tape:

```
RUN  
PRESS PLAY ON TAPE #1  
OK  
1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
1
```

(the tape keeps on going)

The extra 1 is part of the end-of-file marker. This program just keeps on reading tape until it is stopped, for it ignores the ST variable unless you explicitly check for it. To do that, add

these two lines:

```
25 IF ST>0 THEN 50  
50 CLOSE 1
```

(Warning! Restart your PET—any time you interrupt tape I/O you run the hazard of crashing shortly after, which happened to me after doing the preceding example and then trying this one.) Now the DATA 1 tape will be read and shown correctly. Try the other tapes you have and see what is on them.

A Final Pitfall

Sometimes you will have a program that you know works fine with data tapes, and yet the tape drive never stops turning. There are two possibilities: (1) You never rewound your

data tape and (2) Your tape being read is a program tape, not data. Though it seems obvious that such simple mistakes can easily be detected, you will find yourself being caught!

A Useful Program

When tracking down difficult tape file problems, the program listing can be of some assistance. It reads your data tape, a block at a time, and shows the characters on the screen for your inspection. To indicate carriage returns, a reverse field "X" (Shift-V graphics character) is shown instead. As this program is intended for normal alphanumeric data, no provisions are made for graphics or

cursor-control characters. That is an exercise for you, the bold programmer.

When you finish typing the program in, be sure to LIST it and check its accuracy. ■

```
10 REM READING EXAMPLE  
20 PRINT "BIG BROTHER'S PGM"  
30 INPUT "SUBJECT'S NAME";NS  
40 IF NS = "QUIT" THEN END  
50 OPEN 1,1,0,N$  
60 PRINT  
70 PRINT "THE SCOOP ON "N$  
80 INPUT#1, D$  
90 IF ST <> 0 THEN 110  
100 PRINT D$ : GOTO 80  
110 CLOSE 1  
120 PRINT  
130 GOTO 30
```

Fig. 3.

THE BEST IN SMALL COMPUTERS NOW AT 3 NEW STORES!

5C Corporation announces the opening of:

Plainsman Micro Systems

3808 Pepperell Parkway; Opelika, Alabama 36801
P.O. Box 1712; Auburn, Alabama 36830
(205) 745-7735

Valley Computer

Columbus Square Shopping Center, Macon Road, Columbus, Georgia (404) 323-2941

Alabama Computers

Montgomery, Alabama (check information for number, or call Auburn store)

Sales and Service for OSI, Commodore PET and KIM, Compucolor, Altos, HDE, and more.

✓ P42 Reliable, high performance, turn-key microcomputer systems

The BEST of **MICRO**
Volume 1

contains most of the articles from the first year of

MICRO the 6502 journal.

Since back issues are no longer available, this is the only way for you to obtain this important material about the **KIM**, **APPLE**, **PET** and other 6502 based systems.

"The BEST of **MICRO** Volume 1" (Oct/Nov 1977 through Aug/Sep 1978) \$6.00 at your local computer store. By mail: \$7.00 surface, \$10.00 air.

PO Box 3 • Chelmsford, Mass 01824 • 617/256-3649
Subscription: \$6.00 for six issues in U.S.A. Foreign, write for rates.

save more than 20%! NORTH STAR HORIZON

The smartest computer at the smartest price.

Horizon-1 kit, list \$1599	\$1279
Assembled & tested, list \$1899	\$1519
Horizon-2 (2 drives) kit, list \$1999	\$1599
Assembled & tested, list \$2349	\$1879

Datapoint Terminal, list \$814	\$650
Printec-100-cps Printer, 15" paper, 100 characters per second, tractor feed, interfaced for North Star, list over \$3000	\$1500
Yes, you can get a complete North Star business system for only	\$3429
plus shipping.	

2 interconnecting cables	\$50
or free schematic to make your own for less than \$10 worth of material. NC res add 4% tax.	

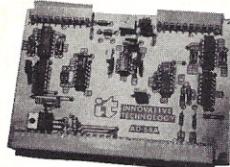
We have business software, too. These printers do IBM quality work. Only 60 available, so hurry. You can make money with this complete business system. Sample printout, SASE.

AMERICAN
SQUARE
COMPUTERS

✓ A66

KIVETT DR • JAMESTOWN NC 27282
(919) 883-1105

AD-68A ANALOG-TO-DIGITAL CONVERTER



- 8 analog input channels
- Occupies one SWTPC 6800 I/O slot
- Quality components and PCB
- Complete documentation
- 90 day full warranty
- Assembled and tested

\$39.95

Available from your local dealer or factory direct. Write for additional information.

✓ I24

INNOVATIVE TECHNOLOGY

510 Oxford Park
Garland, Texas 75043
(214) 270-8393

µ COMPUTER BOARDS

CPU WITH SERIAL PORT
8080A * * * S-100
SINGLE BOARD

Now it's easy—with a CPU Board which includes an on-board serial port. This 2 MHz CPU Board talks directly to your terminal by 20 mA current loop or RS-232. Baud rate selectable from 110 to 9600.

ASSEMBLED AND TESTED ... ONLY - \$195

NEW! AUDIO CASSETTE INTERFACE
WITH 3 PARALLEL I/O PORTS
S-100 * * * SINGLE BOARD

Your best choice for mass storage. This board includes 3 parallel 8 bit ports, a tape motor control (on-off) and a driver for external data I/O monitor lamp. The 3 PIO port common handshake signal lines are independent of data lines.

ASSEMBLED AND TESTED ... ONLY - \$195

OUR 20th YEAR OF ELECTRONIC EXCELLENCE

the
Nucleus
INC.



461 Laboratory Road
Oak Ridge, TN 37830
615-482-4041

✓ N13

TRS-80 SOFTWARE

SORT I—In-memory numeric only sort, 4K Level I BASIC
* Handles multi-field records * Sorts on 2 fields * Ascending or descending seq. * Can be used as subr. * On tape w/documentation \$9.95.

SORT II—In-memory alphanumeric sort, 16K Level II BASIC * Handles KB, Tape, and/or Video I/O * Sorts on up to 5 fields * Ascending or descending seq. * Handles variable length records * On tape w/documentation \$19.95.

BLACKJACK SIMULATOR—4K Level I or 16K Level II BASIC program allows you with a min. knowledge of BASIC to write simple routines to test or develop your "system" to beat BJ. Simulator plays thousands of hands of BJ and keeps W/L statistics. Package includes statistical summary program to analyze data. On tape w/documentation \$19.95.

Northeast MICROWARE

BOX 6153,
SYRACUSE, N.Y. 13217
✓ N16

SPINTERM^{T.M.}

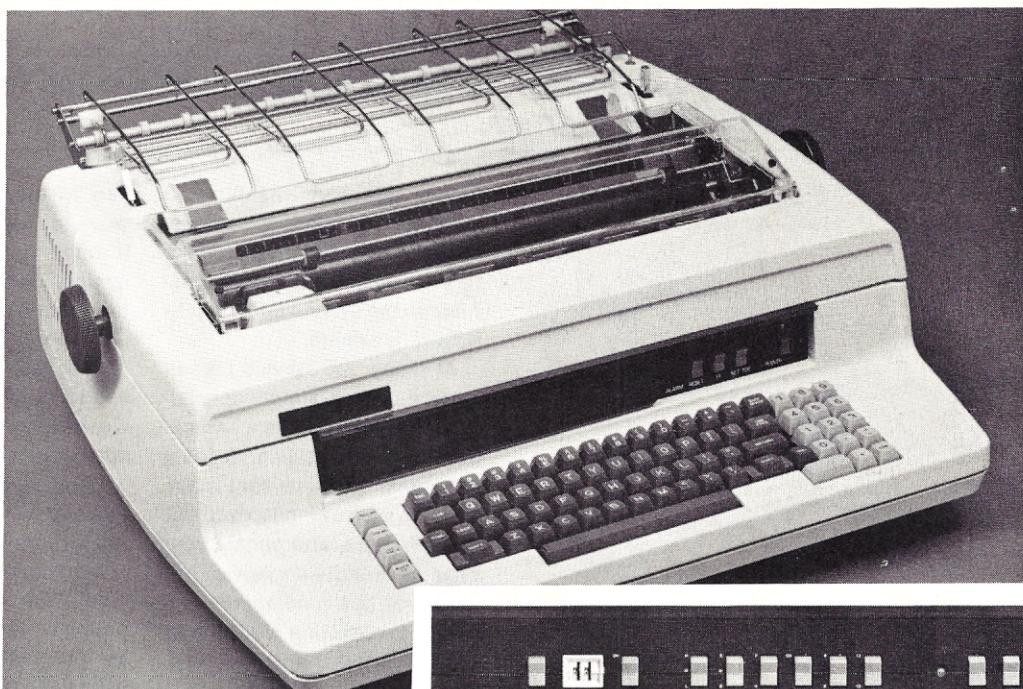
FASTER THAN THE DEVIL!

at 55 characters per second.

More characters—up to 128 on an interchangeable print thimble.

Longer life with a print thimble that gives over 30,000,000 impressions.

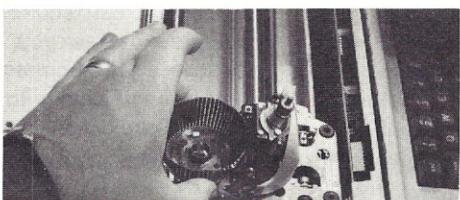
Quieter at 60 dB with hinged covers on, and 67 dB with covers off.



We started with the revolutionary NEC Spinwriter*, added proportional spacing, and BEHOLD! . . . a complete input/output word processing printer!

All this, plus many standard features enable the SPINTERM to outperform other printers in this range of capabilities.

Ribbon and thimble changes are fast and easy.



For instance, the forms length control provides 99 choices of lines. You can select 6 or 8 lines per inch. You have 6 baud rates at 110, 150, 200, 300, 600 and 1200. Industry standard RS-232 interfaces contain a built-in self test. The quality of print can't be beat for it's uniform impression, even through an original and 5 copies. The numeric keypad is standard, along with full ASCII keyboard. You have a choice of ribbon styles, each in a snap-on cartridge. And we can supply an optional full word processing software package.

We've barely scratched the surface of outstanding features which are standard on the SPINTERM. So write us, or call your dealer for complete details.

INPUT/OUTPUT UNLIMITED, INC.
13762 Victory Boulevard
Van Nuys, California 91401 ✓130

(213) 997-7791

*Trademark of NEC Information Systems, Inc.



A Service Bureau for Hobbyists

Where should hobbyists who want to find out about establishing service bureaus turn? Through the pages of this article, for starters.



A service bureau is a company that uses its computer equipment to do work for other people. In the commercial data-processing world, service bureaus have been around for years.

What They Do

Commercial service bureaus work in various ways. Some customers may have their own programming personnel and just rent time on a service bureau's computer rather than buy their own. Other customers may simply send their data to a service bureau and let the

bureau do all the programming as well as the actual computing (i.e., a doctor or dentist who simply fills out a short form for every patient, and then sends it to his service bureau, which processes the information to prepare bills and record payments). This kind of customer lets the service bureau do all his work.

Still other customers use a service bureau as an extension of their own computer installation. Sometimes the service bureau handles only the occasional overflow that the customer does not have time

for on his own machine—a common situation. If the customer's own machine breaks down, he can then send everything to the service bureau until repairs are made.

At times, the service bureau is used only to supply specialized services, such as a particular output device (e.g., a local telephone company that maintains its own computerized list of customers, and once a year goes to an outside service bureau that has a computer-controlled typesetting machine to produce a telephone directory). This last kind of customer uses a service bureau only for the occasional job his own computer cannot handle.

What They Could Do for the Hobbyist

Obviously, computer hobbyists and other small-computer users fall into the same category and have the same problems. Occasionally they want to do something which their own equipment, no matter how large or complex, cannot handle. This article is a description of some services we small-computer users could use from a service bureau, and a proposal that someone, somewhere, might find attractive enough to establish a service bureau just for us.

At the outset, let's understand that small-computer users and hobbyists are very price-conscious; so above all, a service bureau for hobbyists

has to be inexpensive. The only way to keep prices low is through volume and standardization; performing only standard services which can be used by a lot of people. This means that the service bureau has to keep away from custom work—no programming of special jobs for customers.

What kinds of services can be used by many people? They fall into several categories:

1. *More computing power.* This can mean either faster computing or being able to run bigger programs. In general, hobbyists can afford to wait a little longer, so speed should not be too important. But being able to run bigger programs—do bigger jobs—can often be useful. No matter how much memory you have, there always comes a time when you think of a program that requires more. That seems to be a law of nature.

There are some jobs that, though simple, can require a lot of memory unless you use disks or cassette recorders and complex programming to get around it. For example, sorting a big list of names or numbers into order is easy if you have enough memory to store the entire list at one time. It can also be done on disk or cassettes, if you know how and spend the time to prepare the program, but may take much longer. In some cases, the same list may have to be sorted several times into different lists. For example, a mailing list may have to

be sorted into order by name, perhaps by account number, and even by zip code if you intend to mail second-class. A few hundred names may take more memory than the average hobbyist has.

A service bureau could receive a file of data with sorting directions, and a day or two later it would be returned sorted. There are other service-bureau applications, including running large BASIC programs, assembling and disassembling programs and doing other jobs that require more memory than you have. To make a job economical, the service bureau may have to set up a data-acceptance format—perhaps a cassette recorded in a specific way. More on data formats later.

2. Data or format conversion. Frequently a program you want is available on a Kansas City format cassette you can't read because you have a Tarbell cassette interface... or it may be formatted for an Altair 6800 system, and you have an SWTP 6800 system with a different monitor... or perhaps you have a cassette recorded at 1200 baud but can only read 300 baud. There are currently many incompatible data and format standards; it would be handy if a service bureau could translate from one to another.

3. Language conversion. We have already mentioned assembling and disassembling, but there are other possible translations. For example, conversion of programs from FORTRAN to BASIC is not easy, but it could be done.

4. Additional input or output devices. Some input or output devices are cheap: almost every system has a keyboard, many have some kind of video output, and even inexpensive Proko or Oliver Audio Engineering paper-tape readers are available. But how many of us have a good printer, a punched-card reader, a paper-tape punch or a good plotter for drawing pictures? Wouldn't it be nice to prepare an article using your text editor, and then send your edited data to a service bureau and have the bureau return a

neatly typed copy prepared on a Selectric typewriter controlled by the bureau's computer? How about sending a cassette tape of a program, and getting back a printed listing as well as a paper tape? In this way a service bureau could act as an extension of your computer.

How? Standardization

Now, how might something like this be arranged? There are two things to worry about—how to send data back and forth, and how to arrange payment. The payment problem could be resolved by having an account with a service bureau or sending payment with the order; so let's discuss how to send data back and forth.

For some applications the answer is obvious. If you want a cassette changed from Tarbell to Kansas City format, for instance, you simply send it back and forth by mail. Mail service these days is usually fast enough to get your tape back within a week or less.

For other applications, the answer is less clear. Suppose you want a data file sorted. Do you send a cassette tape? What kind? How fast? Or would a paper tape be better? You can't expect a service bureau to read any kind of tape, at any speed, in any format. Some kind of standardization, as well as a system that will allow the service bureau to read your data without error, is necessary. The Kansas City standard would probably be the best choice if cassettes are used, though paper tape or some other medium might be as good. Floppy disks, on the other hand, require careful adjustment; and there might be problems with writing a floppy on one drive and reading on another.

Furthermore, to keep costs low, it will be necessary for the service bureau to specify exactly how the data is to be formatted and recorded on your tape. You would have to adapt to the bureau's requirements as they apply to the header information and other formatting of the

tape. For the service to be inexpensive, you must provide the input in such a way that the service bureau can put it on a computer and immediately process it. You can't expect the bureau to search your cassette, for example, to find the beginning and end of data.

Sending data by telephone effects fast turnaround. As long as you keep the call short or make it after 11 PM or before 8 AM, it need not be expensive. Better yet, the service bureau might have a toll-free number. Many companies have such a number for other use during the day; there is no reason why hobbyists could not use it at night.

Data transmission by telephone is ideal for many of the things a hobbyist might need. For example, if you needed a printout or paper tape of a program you could call the service bureau at night. Their automatic equipment could answer your call, check that your name or account number was on their list of known customers, and record your data. The next morning the printout or paper tape of your program could be in the mail for delivery a day or two later. If we are going to use phone lines to transmit data, it

might be convenient to adopt the same standards that are used by time-sharing computer services. This involves the use of modems and, possibly, acoustic couplers.

Using Modems

In time-sharing systems, data is usually sent between a central computer and a remote teletypewriter or CRT terminal using serial ASCII code at either the standard 110-baud teletypewriter speed, or at 300 baud. The conversion between digital data and the audio tones that are sent over the telephone lines is performed by a modulator-demodulator circuit called a *modem*. The modem can either be connected directly to the phone line (through a phone-company-supplied "protective network" called a Data Access Arrangement) or coupled acoustically into the telephone handset. The acoustic coupler usually has the modem built into it. One such acoustic coupler, available in many computer stores, is the Pennywhistle (described in the March 1976 issue of *Popular Electronics*). Used acoustic couplers are often advertised in the back pages of *Kilobaud*.

Two modems are always



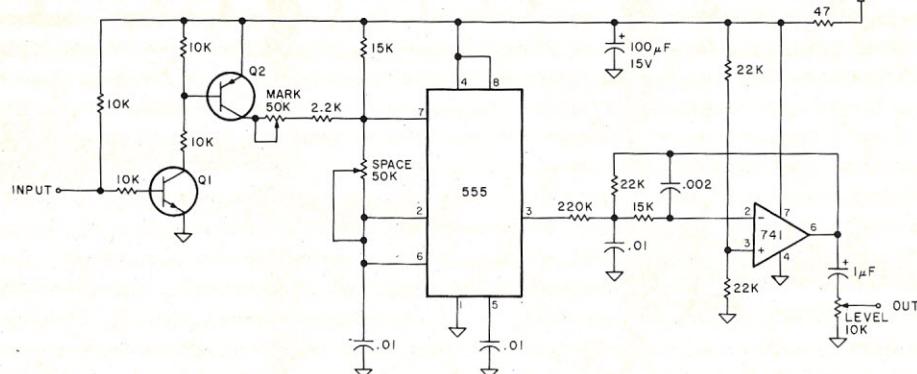


Fig. 1. FSK modulator no. 1.

used, one at each end of the telephone line. Each modem generates a pair of audio tones and receives a different pair, with the modems arranged so that the pair of tones generated by one modem is received by the other. The reason for using different pairs of frequencies to send and receive is to permit data to go in both directions at the same time without interference. To avoid the mess that might result if both modems sent or received the same frequency tones, one of the two is called the *originate* modem; the other is called the *answer* modem. There is a slight difference in construction between the two.

The frequencies used are the following: Transmission from the originate modem to the answer modem uses 1270 Hz for a digital 1 and 1070 Hz for a digital 0. Transmission from the answer modem to the originate modem uses 2225 Hz for a digital 1 and 2025 Hz for a 0. As the digital ones and zeros are sent out one after another, the tone shifts in frequency between the higher or lower frequency of each pair. This is called *frequency shift keying* or FSK. This choice of modulation and frequencies dates back to a Bell model 103A data telephone introduced earlier by the phone companies. It is often called *Bell 103A compatible*.

In standard time-sharing, the teletypewriter machine or CRT terminal and its modem usually call the central computer, and thus use an originate modem sending out 1270 and 1070 Hz. The central computer has an

answer modem that sends out 2225 and 2025 Hz. (In specific cases the situation could be reversed.) Most modems are capable of being answer modems or originate modems, but not both. The Pennywhistle or other generally available acoustic couplers are originate modems—they can communicate with an answer modem but not with each other.

It now becomes obvious that there are advantages to adopting the same method for communication with service bureaus. You would, of course, have an originate modem to call the answer modem connected to the central computer at the service bureau. You could either have a modem connected directly to telephone circuitry, or you could use an acoustic coupler.

Until service bureaus for hobbyists become available, there is a simple way to experiment with telephone transmission of data. Many companies and schools already have a computer terminal of some kind with an acoustic coupler—usually a Teletype or some other kind of teletypewriter or CRT terminal. Many are equipped with a paper-tape punch. If you have access to one of these machines, you could send some data to it over the phone and get printed listings or punched paper tape output. Since that terminal will

probably have an originate modem or acoustic coupler, you will need an answer modem or coupler to communicate with it. (This does not necessarily mean the call has to be placed from the other end—you

can call either way as long as there are two different kinds of modems at the two ends.)

Answer modems are much less common than originate modems, so they're more expensive. There are other ways to acquire them. You could try to modify the Pennywhistle circuit or build your own. For example, Motorola makes an MC6860 integrated circuit specially designed for making modems, and Motorola's application note AN747 adequately describes the circuitry needed. "An excellent article by Ron Lange on building a modem with the Motorola MC14412 appeared in *Kilobaud* No. 11 (November 1977); by the throw of a switch, this modem can be used as either an originate modem or an answer modem."

It is much easier, however, to build only half of an answer modem—the half that sends. In this way, you will be able to generate the 2025 and 2225 Hz

tones you need to send data to the originate modem, but will not be able to receive. This will still enable you to send data out and have it printed, and perhaps even punched, at the other end.

If you already have a cassette interface that can store data on the cassette as ASCII characters at 110 or 300 baud with start and stop bits, you might add some extra circuitry to switch-select the new frequencies of 2225 Hz for a 1 and 2025 Hz for a 0. In most cases, all that is needed is a DPDT switch and two potentiometers for adjustment.

If you do not have such an interface, it is fairly easy to build an FSK oscillator that will shift back and forth between 2225 and 2025 Hz to generate the right tones. First, you need a serial output from your computer to send out Teletype-compatible serial ASCII code. Although you could get a UART interface that generates the required code directly, you can also use one of the bits on an output port and use software to generate the required serial output. Once you have the ASCII code, the circuit of either Fig. 1 or Fig. 2 will generate the right tones for you.

Fig. 1 is more complicated but has the advantage of using readily available parts that you may already have in your junk box; in any case, they are available at Radio Shack. In this circuit, a 555 timer IC generates a

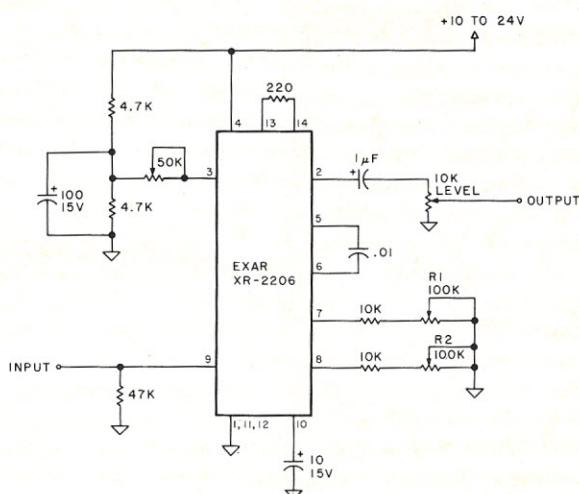


Fig. 2. FSK modulator no. 2.

square wave at the proper frequency, while an active low-pass filter using a 741 op amp removes the harmonics and converts the square wave to a fairly good approximation of a sine wave. Any common low-power silicon NPN and PNP transistors may be used for Q1 and Q2, respectively.

The circuit is set up so that a low or ground input generates the space or 0 tone of 2025 Hz, whereas a high or open input generates the mark or 1 tone of 2225 Hz. When the input is grounded, both Q1 and Q2 are off, and the MARK potentiometer is not used. At this point, the SPACE pot should be adjusted for an output frequency of 2025 Hz with a frequency counter connected to pin 6 of the 741 amplifier (which can be replaced with a 5558, 1458, 748 or other op amp as long as the right pin connections are used). Once the SPACE pot is adjusted, make the input open-circuit and adjust the MARK pot for a frequency of 2225 Hz.

The adjustment of the LEVEL pot depends on your use.

To tape the output, use the AUX input on the cassette recorder if one is available; the MIKE input can be used, but avoid setting the level too high. If you are going to couple the tones to the telephone line, acoustic coupling to the mike of the handset is possible using a small high-impedance earphone to generate the sound. Direct electrical connection to the telephone line, while technically feasible and even preferable, is frowned on by Ma Bell.

Fig. 2 shows an alternative circuit. Though simpler, it requires a special Exar XR-2206 function generator IC. This IC can directly generate a fairly clean sine wave with the circuit shown; the 50k pot connected to pin 3 should be adjusted for the least distortion. The frequency of the output is set by the 0.01 μ F capacitor connected between pins 5 and 6, as well as the resistance connected to either pin 7 or pin 8,

depending on the input to pin 9. If pin 9 is ground or low, pot R2 sets the frequency; if pin 9 is high, pot R1 sets the frequency. Hence, the frequency can easily be shifted by applying the digital data directly to pin 9. Simply decide whether your available data has its high input level representing 0 or 1, and then adjust R1 and R2 for the proper frequency.

Be careful when you use a frequency counter to set the oscillator frequency. Neither circuit produces a perfect sine wave, so some counters may count each cycle twice or three times. Hence, the counter may read 2025 or 2225 Hz when the actual frequency is only half or one-third of that. If in doubt, you may use a piano or organ and listen for the appropriate tone—2025 Hz is just a bit under the third C above middle C, while 2225 Hz is the C-sharp just above it.

When communicating with an originate modem, you will have to send 2025 or 2225 Hz to

the originate modem for perhaps two or three seconds before it will respond with 1270 Hz and start receiving data. At that time, the CARRIER light on the originate modem will light, indicating that it has received a signal from you. To make sure the modem is receiving your signal, listen to the 1270 Hz signal coming back to you: If you don't hear it, that means the modem does not hear you.

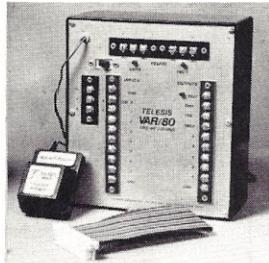
For experimental purposes, you can even tape-record your data on a cassette. Use a fairly good cassette recorder and be sure to use the same machine both for recording and playing back. Another way to keep the speed more constant is to use an ac adapter rather than rely on batteries.

So, to all you budding businessmen out there, here is a challenge if you want to make some money and offer a worthwhile service to other hobbyists. This might be your first step toward a successful hobbyist service bureau. ■

TRS-80 TRS-80 TRS-80 BELLS and WHISTLES

Now, you can interface your TRS-80 (Level II BASIC) to the "Real World" with Factory Assembled, Tested and Guaranteed TELESIS Products.

VAR/80



I/O Interface Unit \$109.95 ppd*

- 8 outputs (2 with relays)
- 8 inputs (2 with opto-coupler)
- Interconnecting cable, power supply
- Application hints and software

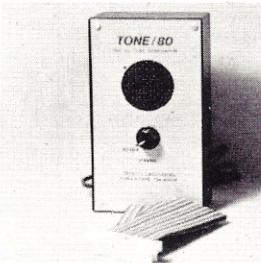
To order your TELESIS VAR/80 or TONE/80 contact your distributor or send directly to TELESIS LABORATORY.



Use your Master Charge or Visa.
Or just send along a Money Order
COD orders accepted

*Prices include shipping within the U.S. Ohio residents please include additional 4% Sales Tax.

TONE/80



Programmable Tone Generator \$89.95 ppd*

- 129 different tones
- Volume control, built-in speaker, interconnecting cable, power supply
- Software package—programs for tunes, wolf whistles, sirens and more
- Notes on adding sound effects to games



TELESIS LABORATORY

100 R&D Drive, P.O. Box 1843 Chillicothe, OH 45601

✓ T51

Kilobaud Classified

Kilobaud Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment or software. No commercial ads are accepted.

Two sizes of ads are available. The \$5 box allows up to 5 lines of about 37 characters per line, including spaces and punctuation. The \$10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or not applicable advertisements. Mail copy with payment to: **Kilobaud Classified, Kilobaud, Peterborough NH 03458**. Do not include any other material with your ad as it may be delayed.

TRS-80 software on cassette or disk: mail, inventory, word processor, data base, stock, check, statistic, sort. Poi Pow, 96 Dothan St., Arlington MA 02174.

PET Super Card Game, great graphics. *31/Klinker*, dynamic computer logic. Lots of fun to play. Send \$10 to Carol Donovan, 84 Christy Rd., Battle Creek MI 49015. Cassette included.

PET 1-Player Checkers. Graphic display, board shows all moves, realtime status shown. Send \$5 to Carol Donovan, 84 Christy Rd., Battle Creek MI 49015. Cassette included.

TRS-80, Level I, 4K, software. Checkbook, Graphing, Demo. Pgm., Metric Teacher. All on tape for \$10. Robert Lancelot, 1871 Acorn Dr., St. Joseph MI 49085.

Original PET Software! A variety of action games with graphics and sound effects, useful math routines, interfaces (Teletype, parallel printers and telephone) and a program for creating, saving and playing back music. Send for a free catalog today. Peter Ruetz, 368 Albion Ave., Woodside CA 94062.

TRS-80 Level II programs on cassette. 4K: Lunar/Martian Lander with 3 degrees of freedom (\$8). 16K: Battle Klingons, Romulans with Star Trek (\$10); you name teams in College/Pro Football (\$12); shoot down attacking aircraft in Carrier Battle (\$6). R. Fitzgerald, 3338 Sheila Lane #292, Dallas TX 75220.

Micropolis software special: Investment analysis package, \$30; Home/family package, \$30; Game package, \$15; Assembly language prog. course for beginners, \$30; Raw acts-receivable program ready to personalize, \$95. Order now. Phil Bell, 813 MacArthur Dr., Urbana IL 61801.

TRS-80 Monthly Newsletter. For information write to: Howard Y. Gosman, Box 149, New City NY 1056.

*Books of computer games in BASIC. ENIGMAS-1 (\$8): Gone Fishing, Concentration, Starship, Craps, Slot-Machine, Sherlock Holmes, Tank Attack. ENIGMAS-2 (\$8): Number Guess, Mortar Battle, In-Between, Shell Game, Safari, Starship-2, Dice Roll, Puzzle. *Catalog and test program Frog Race, \$1. Available in Standard BASIC, SWTPK 8K BASIC or Radio Shack TRS-80 BASIC. Please specify. B. Erickson, PO Box 11099, Chicago IL 60611.

We had replacement panels made for our Altair 8800s. They're blue against a white background and really look nice! We'll sell the extras for \$19 each. D.L. Tibbets, 520 Schoolhouse Ln., Willow Grove PA 19090.

6800 microprocessors. Limited number. All new parts. \$12 each. Mike Connolly, 7911 Langdon, Houston TX 77036.

PET-2001-8 Music kit: Install the amp and speaker in two hours. Drill only one hole above fuse. Software and all hardware inc. \$14 & \$1 postage. Lou Ensten, Box 6, Twinsburg OH 44087.

For Sale: Digital Group Phi-Deck cassette system. 4 computer-controlled tape drives in handsome cabinet, controller, cable, documentation and software. 2M bytes on line (C-60 cassettes) with any system. \$675 or best offer. Write John Ciaccia, 5707 Valley Pt., San Antonio TX 78233 or call evenings (512) 654-0338.

OSI Software on tape 440 or 540: 1) Fleet action, bio, math; 2) Starfighter, gleep, mastermind 540; 3) Demonstrator, bomber; 4) Gobblin, bouncaround; 6) Bowling, for graphics chip; 5) Kiddie video-pak; 7) Sealowife; 8) Demo & bomber-graphics; 9) Concentration—\$8.95 per pak with documentation; \$60 for all. R. Olsen, 1690 Bolton, Walled Lake MI 48088.

ADM-3 Lowercase parts kits with complete instructions, \$39. Nancy G., 57 Manor Drive, Hudson OH 44236.

TRS-80 Owners: Built limited number of modems for the TRS-80. Will work with any configuration of TRS-80. I will make them only to the amount of orders I receive in the first two months after this ad is published for the price of \$50. After this, they will be \$75. Delivery within two weeks after I receive the order. Send check or money order for a modem, two for 15% off, to Sandy Sigal, 6851 Mammoth Ave., Van Nuys CA 91405.

TRS-80 Users: Excellent business program for a 16K Disk BASIC TRS-80 computer with 1 or 2 disks. A mass indexing program that allows storing items and retrieving them for review, alphabetization, editing. At least 2000 items stored per disk. Alphabetizes automatically and is fully self documenting. Gives index of all items on disk. Excellent for all applications. \$50 to Sandy Sigal, 6851 Mammoth Ave., Van Nuys CA 91405.

TRS-80 software on tape. Games and more with documentation. Also some hardware offerings. Send SASE for more info. Liberty Ridge Homestead, RR 1, Box 44B, Rockport IN 47635.

Micro Users Tax Booklet '78 shows how to slash taxes with deductions for micro. Many illustrations and examples. \$4.99. MicroTax '78 completes 1040, schds A, B, C, D and others in minutes. Eliminates errors, missed deductions, and saves time. 16K TRS-80 Level II. \$9.99. Save \$2; order both for \$12.98. Check or MO: George Clisham, PO Box 1172, Duxbury MA 02332.

TRS-80/POLY/PET software: Bomber, Biortm, Lander use graphics, fits 4K, on tape—\$9.90. Request FREE catalog. (Specify computer type.) G. F., Jester Cntr-W58, Austin TX 78784.

Wanted: TRS-80 Level II software for Travel Agency accounting system. Art Lyon, PO Box 353, Ocala FL 32670.

Wanted: Manual for Instant Input Assembler-Version 1 (for 9900 Super Starter System by Technico). Will pay at least original cost. William T. Wilson, 203 Oxford St., Portland ME 04111.

For Sale: OSI Challenger 2p with 540 video and polled keyboard—with extra 4K board for a total of 8K. Price, \$650. Bruce Higer, 19 Woodland Dr., Sands Point NY 11050. (516) 883-9543.

For Sale: RCA VIP assembled and tested with 4K static RAM and 8 bit I/O port. \$245. S. Brohn, Jr., 10265 Darryl, Baton Rouge LA 70815.

Swiss business group is looking for buyer, representative, or contact man to buy hardware and software in the USA. Could also be part-time work, possibly someone retired. Write to: INTERFACE TECHNIC, PO Box 761, CH-4002 Basel, Switzerland.

Complete set Kilobaud magazine #1-21—\$85. I pay postage. Nick Copping, 2744 Community, La Crescenta CA 91214.

TRS-80 Owners. I am interested in surveying TRS-80 users. Write: Professor Bill Parks, Chase-203, State University College, 1300 Elmwood Ave., Buffalo NY 14222.

TRS-80 Level II Reference sealed in plastic. Summarizes commands, reserved words, error codes and more; just \$2 postpaid. Send SASE for list of well documented practical programs. J. DeMita, PO Box 570, Lynbrook NY 11563.

For Sale: 2 National Multiplex 3M3-A digital cassette recorders and 2510R interface/monitor board. Storage capacity per 3M data cartridge of up to 2 megabytes. Search capability up to 50 kilobaud/sec. Will sell for best price over \$350. B. Wagman, PO Box 57091, Washington DC 20037.

For Sale: MECA dual cassette & controller, Digital Systems dual 8" & controller, 2 ea. 16K TDL memory boards. Make offer. (714) 770-7789.

Linear programming (Simplex Method): builds its own table: short easy data entry (free-form input on Level II): TRS-80 Level I & II: memory is dynamically allocated (10 equations—12 unknowns), will run in 4K: cassette & documentation; \$15 ppd: Henry Camin, 7101 Chinaberry Rd., Dallas TX 75249.

KIM Users: Powerful Console Input Monitor (CIM) lets you enter, edit and execute programs from ASCII encoded keyboard on basic KIM. CIM modes are: Address, Program, Text, Data, Increment, Decrement and Execute. CIM was developed by an experienced EE and is fully supported for future expansion. Complete user's manual includes interfacing ASCII keyboard to KIM. \$16.50 ppd. Add \$5 for CIM cassette. E.R. Kittlaus, Box 2175, Seal Beach CA 90740.

For Sale: TI TM990/100M-I microcomputer board with TIBUG monitor in ROM, 256 words of RAM, TM990/103 microterminal, TM990/511 extender board and all documentation. It is a great machine. I just don't have time to build a system around it. List price is over \$750. It's yours for \$550 ppd. Bill Gano, 1634 E. Drachman, Tucson AZ 85719.

33ASR like new, \$850. 101C data set (110 baud modem), very nice, \$200. Call Control Unit to interface above, \$100. All three \$1,000. Joe Turtle, PO Box 147, Corunna MI 48817. (517) 743-4607 after 6PM.

PET Programs: 50+ programs available. \$2.50 first program & tape, \$1.50 ea. add. program. SASE for list: R. Grokett, 401 Monument Rd. #177, Jacksonville FL 32211

TRS-80 Level II Software: CONTRACT BRIDGE, \$15. Disassembler, using Zilog mnemonics, \$20. Assembler LIFE, \$6. Send SASE for details. Hubert Howe, 14 Lexington Road, New City NY 10565.

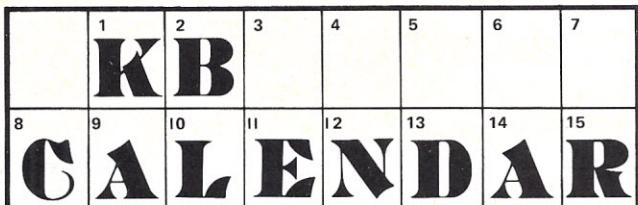
CIRCLE CHESS instruction book by Alphonso, used in Circle Chess software development, \$5. Stanonis, Box 63, Des Plaines IL 60017.

KIM-1 w/8K memory, 32x64 video board, cassette controller, power supply, oak enclosure, software. \$600. James W. Stork, 2404 Broadway, San Diego CA 92102.

Microwave Users Group: Reinventing RT68 or ABASIC wheels? First issue includes adaptions of compiler for printers, CRT terminals and SWTP calculator module. Send your great ideas and applications and/or \$10 for year's subscription to MICROWARE FORUM, Box 3630, Dept. MK, Minneapolis MN 55403.

SWTP 6800 Users: My system has been running under hard use *continuously* for a year—all day, every day—with no failures. Send \$5 for info package on reliability mods for SWTP. TARA, Box 3630, Dept. RK, Minneapolis MN 55403.

Disk Users: Would you like to store twice as much data on each disk? If your system uses the Shugart SA-400 drive, send \$4.50 (the cost of a disk) to find out how. No hardware to buy. TARA, Box 3630, Dept. DK, Minneapolis MN 55403.



Blacksburg VA

A new and expanded series of four 3-day hands-on workshops on 8080/8085 design, microcomputer interfacing, software design and digital electronics is being given by the authors of the popular Bugbooks. Participants have the option of retaining equipment used in these courses. Dates are March 19 to 28, 1979. For more information, contact Dr. Linda Leffel, C.E.C., Virginia Polytechnic Institute and State University, Blacksburg VA 24061, (703) 961-5241.

Anaheim CA

MIMI '79 Anaheim International Exhibition will be held January 16-19 at the Disneyland Hotel, 1150 W. Cerritos Ave., Anaheim CA 92802. For further information, contact Armida Hisquierdo, MIMI '79 project manager, 1811 W. Katella, Suite 105, Anaheim 92804, (714) 774-6144.

CORRECTIONS

In the October 1978 New Products section, page 16, we mistakenly listed the address of R2E of America as 306 University Ave., Minneapolis MN 55414. That address should have been 3406 University Ave., Minneapolis 55414.

Regarding my article, "Home System Demo Program," in the September 1978 issue of *Kilobaud*. I have recently changed my address, causing problems for people trying to get in touch with me. My new address is: 948 Valentine Road, Oconomowoc WI 53066.—Mark Herro.

Notice of Copyright

Regarding the use of "Context" in "(Con)text Editor" by R. M. Law and D. C. Mitchell (September 1978, p. 22): our Corporation are registered owners of the word "Context" as it relates to programs and equipment, etc.

Context Systems, Inc.
London, Canada N6A 3C7

Educational games? SOLOMON HOUSE offers the Game of the States. PET graphics help make learning the names, spelling and geography of the states of the union fun for all ages. Information and list of available programs free. For Game of the States program tape and documentation send \$4 to S. M. Solomon, 276 Buckingham Ave., Milford CT 06460.

Rockwell XPO-1 Development system for PPS-4/1 uPs. With optional assembler, p.s., 1K RAM. Never used. \$450. G. Hyman, 22 Cross Hill Ave., Yonkers NY 10703. (914) 968-9700.

More people than ever
are using the classifieds.
Shouldn't you be?

8K BASIC for KIM-1

The famous high speed *Microsoft BASIC* is now available for KIM-1. The 9-digit accuracy version is available on cassette or paper tape.

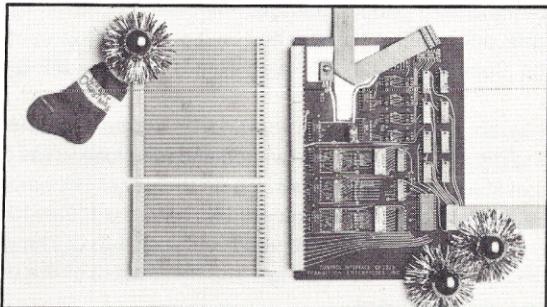
DELIVERY FROM STOCK.

\$99.00

\$2.00 shipping and handling

**JOHNSON
COMPUTER**

P.O. BOX 523
MEDINA, OHIO 44256 (216) 725-4560



6800 OWNERS

At last a real world **fully addressable** SS-50 control interface. Control robots, appliances, organs, solar devices, etc. Applications limited only by your imagination. Easy to use with machine language as well as basic. Fully buffered board plugs directly onto mother board and responds to any address defined by user. 8 fast relays latch data while 8 opto-isolators allow handshaking capacity.

Kit \$98.00

Assembled and tested \$125.00

EXTENDER BOARDS

Extend both the 30 and 50 pin buses in SWTP 6800.

Both for \$19.95.

Visa & Master Charge • Ariz. Res. add 5% Sales Tax

WRITE FOR DETAILS

TRANSITION ENTERPRISES INC. ✓T46
Star Route, Box 241, Buckeye, AZ 85326

Little Bits

Glen Deibert
431 Dunmore Rd.
Fayetteville NC 28303

Albert C. Brunelli
RFD #1
Berlin NH 03570

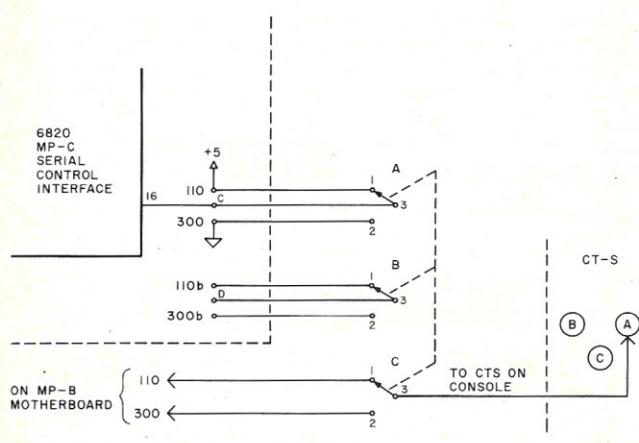
Baud Rate Control for the SWTP

I recently had the experience of connecting a 100 wpm printer to my SWTP system and very quickly became tired of writing my BASIC programs, debugging and listing at a 110 baud rate. This slow working system was modified as shown in the schematic shown below. By changing the switch position I could do all my work at a faster speed, including using my tape interface.

After the program had run correctly on my video display and everything looked good, I changed the switch position to the 110 baud rate, accessed my printer and let it go at its slow speed. Note that the clock for my CT-1024 also comes from the MP-B motherboard.

To prevent unwanted radiation and its inherent problems, the wiring to the switch should be twisted and run close to the chassis. On my system I installed the switch on the upper left-hand corner of the face plate and tacked soldered wires to the 110 and 300 baud connectors on the MP-B board and then to switch C. The wiring to the MP-C board was run down against the bottom of the case and back to the MP-C board.

I can now do my thing at 300 baud and let the printer do its thing at 110 baud, and we are both happy.



Baud rate control for SWTP system.

One Incompatibility, Solved

I am responding to Bill Fuller's request for information ("Compatibility and the Altair Bus," p. 100, *Kilobaud*, July 1978) regarding compatibility of various products.

I recently purchased the Cromemco D + 7A (seven-channel A/D and D/A with one parallel I/O port) for use on my system, which consists of PolyMorphic CPU and video boards with 16K RAM in a TEI 12-slot mainframe.

The assembly of the board was relatively easy, but I would not recommend it for a novice. The instructions were quite clear on how to rejump the port address lines as is necessary when using the PolyMorphic CPU. The fun began when it came time to calibrate the converter.

I used two D cells and a 1k pot as shown in Fig. 1, along with a Fluke 8020 DMM to set the calibration voltages. The ground lead will go to either A or B, as both positive and negative voltages are required for calibration.

With everything hooked up and ready, I turned on the machine and entered the calibration program. Nothing happened! I received no output from the converter at all. I rechecked all the connections and supply voltage levels and found everything in order there.

Next I took out the scope and started checking the address and data lines to make sure everything was coming in all right. They were OK, so I next checked the signals into the decoder on the board. Naturally, the decoding section is down near the bus where it is difficult to get at with a probe (some day I will have to get an extender board). If access to the decoder had been easier, I would have found the problem sooner. As it was, I had to find it on the schematic.

One of the signals into the 74LS30 decoder was an inverted PHLDA. The PolyMorphic CPU does not output such a signal, and thus one of the input lines to the 74LS30 was always held low by the inverter, and my address was never decoded.

To solve this incompatibility, I placed a jumper across C59, which is a 150 pF capacitor at the input of the PHLDA inverter (Fig.

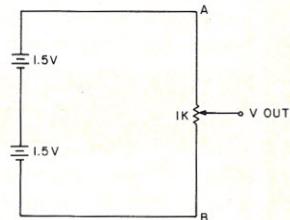


Fig. 1.

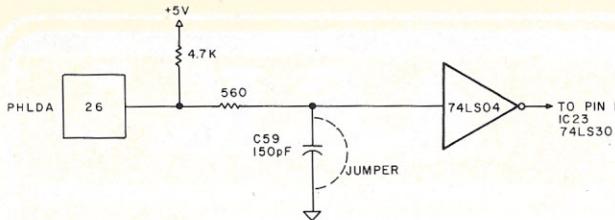


Fig. 2.

2). This jumper will hold pin 1 of the 74LS30 high at all times and will enable me to address the port. Also, it is easily removed in case the board is to be used in a different system.

I think that problems like this could be avoided if the manufacturers would include more information on the operation of the hardware.

James J. Brennan
3475 Auburn-Folsom Rd.
Loomis CA 95650

VDM Clock Program: for Those Idle Moments

The following is an excerpt from a letter that accompanied this Digital Clock Program.

I have neither the time, skills nor inclination to write detailed articles, particularly on software. On the other hand, I am more than willing to share what I have with others if I can do it with "zero hassle," or something approaching it.

I can't help but believe that there are many others who feel the same way and would take the time to print a listing and a run of their programs, and perhaps enclose a short informal note about them, and spring for the postage. I, at least, am not usually interested in doing much more than that.

I enjoy fully documented articles along with the software you publish because they are helping me learn; but I am also interested in *using* this machine, even if I don't fully understand just what is going on inside it. Without software, this thing just sits here, so I like to see even undocumented software published (so long as it runs).

I really believe that if you offered to publish your readers' efforts, without trying to turn them into authors, you would see a lot of freely given programs of interest to your readers (or at least some of your readers) coming across your desk.

My system is an Imsai with 28K, a Tarbell interface, VDM and a Qume printer in an ITS (now a DMC) terminal. The real purpose behind this system is to eventually figure out how to run my pipe organ (four manuals, 140 ranks of pipes, e.g., about 7000 pipes) and record what was played. That's another story!

I hope you'll give thought to my suggestion for a readers' software section. If you set up something like that, I'll send you some more listings, including some that I submitted to one of your competitors if they don't get around to printing them (and I doubt that they will, but that's also another story!).

We're definitely not looking for War and Peace-length programs with no accompanying article/documentation. But if you want to do something similar to what Jim suggests in the second paragraph, send your efforts in and we'll give them due consideration.

```

100 REM DIGITAL TIME CLOCK PROGRAM
200 REM WRITTEN BY JAMES J. BRENNAN
300 REM SEPTEMBER 3, 1976
400 REM USING ALTAIR BASIC, 12 K VERSION 3.2
450 REM
500 PRINTCHR$ (126)
600 DEF FNV(X) = X-13313
650 PRINT"THIS PROGRAM WILL DISPLAY A DIGITAL TIME CLOCK IN THE
660 PRINT"FORMAT:
670 PRINT
680 PRINT TAB(20):PRINT"HH MM SS ZZZ"
685 PRINT
686 PRINT"WHERE H=HOURS, M=MINUTES, S=SECONDS, AND Z=TIME ZONE
690 PRINT
700 PRINT"ENTER THE TIME IN TWO DIGIT NUMBERS SEPARATED BY SPACES
800 PRINT"BETWEEN THE HOURS, MINUTES, AND SECONDS.
850 PRINT
900 PRINT"WHAT WILL BE THE EXACT TIME THAT YOU WILL HIT THE
910 PRINT"RETURN KEY";
1000 INPUT TS
1100 TH=VAL(MIDS(TS,1,1)) +48
1200 H=VAL(MIDS(TS,2,1)) +48
1300 TM=VAL(MIDS(TS,4,1)) +48
1400 M=VAL(MIDS(TS,5,1)) +48
1500 TS=VAL(MIDS(TS,7,1)) +48
1600 S=VAL(MIDS(TS,8,1)) +48
1800 PRINTCHR$ (126)
1900 OUT 200,0
2000 IF ST=58 THEN ST=48:S=S+1
2100 IF S=58 THEN S=48:TS=TS+1
2200 IF TS=54 THEN TS=48:M=M+1
2300 IF M=58 THEN M=48:TM=TM+1
2400 IF TM=54 THEN TM=48: H=H+1
2500 IF H=58 THEN H=48:TH=TH+1
2600 IF TH=49 AND H>51 THEN TH=48:H=(H-2)
2700 IF TH=50 AND H=48 THEN TH=48:H=56
2800 IF TH=50 AND H=49 THEN TH=48:H=57
2850 IF TH=50 AND H=50 THEN TH=49:H=48
2860 IF TH=50 AND H=51 THEN TH=49:H=49
2870 IF TH=50 AND H=52 THEN TH=48:H=48
2900 IF TH>50 THEN GOTO 9000
2901 IF H>57 THEN GOTO 9000
2902 IF TM>54 THEN GOTO 9000
2903 IF M>57 THEN GOTO 9000
2904 IF TS>54 THEN GOTO 9000
2905 IF S>57 THEN GOTO 9000
2906 IF TH>50 AND H>3 THEN GOTO 9000
3000 POKE FNV(475),TH
3100 POKE FNV(476),H
3200 POKE FNV(477),32
3300 POKE FNV(478),TM
3400 POKE FNV(479),M
3500 POKE FNV(480),32
3600 POKE FNV(481),TS
3700 POKE FNV(482),S
4000 POKE FNV(485),80
4100 POKE FNV(486),68
4200 POKE FNV(487),84
5000 S=S+1
6000 Q=273
6100 FOR I=1 TO Q
6200 NEXT I
7000 GOTO 1900
8000 REM TO MAKE THE CLOCK RUN FASTER, REDUCE THE
8001 REM VALUE OF Q IN LINE 6000.
8002 REM
8003 REM TO CHANGE THE LOCATION OF THE DISPLAY,
8004 REM CHANGE THE VALUES OF FNV( ). .
8005 REM IN LINES 4000 - 4200 THE LAST TWO DIGITS ARE
8006 REM THE CODES FOR P D T , TO CHANGE TO SOME OTHER
8007 REM TIME ZONE, ENTER THE ASCII CODE NUMBERS OF THE
8008 REM CHARACTERS DESIRED.
9000 PRINT" THIS IS NOT A POSSIBLE TIME IN THIS WORLD. WHERE
9001 PRINT" DID YOU COME FROM? START OVER BY TYPING RUN AND HIT
9002 RETURN.
9003 END
OK

```

Program Listing.

Short Program to Print SWTP Instruction Code

Richard Wright
676 Coe
Tiffin OH 44883

pointed to by A061, A062 and A06A, A06B and returns the MIKBUG at the end of the run. It starts at A060.

As listed, A061, 62 and A06A, 6B point to SWTP 8K BASIC version 2.0 instruction code.

A friend sent me a copy of SWTP BASIC on cassette but no documentation. I wrote the following program to print the instruction code.

This program (SWTP 6800) prints ASCII characters between memory locations

A060	CE	0160	LDX #0160
A063	A6	00	LDA, 0,X
A065	BD	E1D1	JMP OUTEEE
A068	08		INX
A069	8C	0350	CPX #0350
A06C	26	F5	BNE
A06E	BD	E0E3	JMP MIKBUG

10% OFF 20% OFF



YOUR OWN TRS-80 SYSTEM AT TREMENDOUS SAVINGS

TRS-80

Model	List Price	Our Price
Level II-4K	\$698.00	\$628.20
Level II-16K	\$988.00	\$889.20
Expansion Interface	\$299.00	\$269.10

COMPATIBLE PERIPHERALS

Item	List Price	Our Price
Mini-Disk System		
1st Drive w/DOS	\$499.00	\$395.00
Additional Drives	\$489.00	\$385.00
Line Printer		
Anadex DP-8000	\$1299.00	\$1075.00
Centronics 779	\$1299.00	\$975.00
Centronics 779 w/pin feed	\$1399.00	\$1100.00
16K Memory Kit	\$290.00	\$98.00

SUPPLIES

Diskettes	\$4.95 ea. • 3 for \$12.00 • 10 for \$37.50
C-10 Cassettes	5 for \$4.50 • 25 for \$18.75
Paper (8½" x 11" forms; 3500 per carton)	\$19.95

Master Charge and VISA accepted ✓ V19

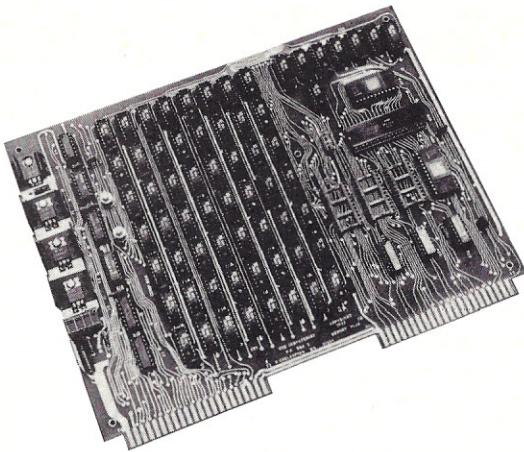
VR DATA CORPORATION
777 Henderson Boulevard, Folcroft, PA 19032
(215) 583-5101

ASK™

The COMPUTERIST® how to expand your system four ways with one multi-purpose pc board --

MEMORY PLUS™

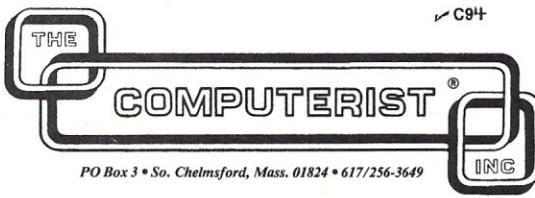
- 8K Power STATIC RAM
- 8K EPROM logic (INTEL 2716/TI 2516)
- EPROM PROGRAMMER
- I/O - Versatile Interface Adapter
 - 2 8-bits ports + serial/parallel shift register + timers
- On-Board VOLTAGE REGULATORS
- Switch Selectable Address for RAM and ROM
- All ICs are socketed
- AIM 65 / SYM-1 / KIM-1 Compatable
- Assembled - Tested - Burned In
- Hundreds in use around the world
- Reasonable Price - \$245 (without EPROMs)
- Free Connection Cables with this AD.



The COMPUTERIST® is a leading producer of products for the AIM/SYM/KIM (ASK™) family of microcomputers. Send for your copy of our catalog which describes our current and soon-to-be released product including:

VIDEO PLUS™, MOTHER PLUS™, POWER PLUS™; PROTO PLUS™ and other ASK hardware; PLEASE™, HELP™ and other ASK software; Enclosures for the AIM, SYM, and KIM.

✓ C94



PO Box 3 • So. Chelmsford, Mass. 01824 • 617/256-3649

KIM-1 EXPANSION

- 0 KIM-4 Motherboard \$119.00
 - 8K Static RAM \$195.00
 - 8K PROM Board \$195.00
 - 64 Character/line Video \$149.00
- 0 KIMSI S-100 Motherboard \$165.00
 - 8K Static RAM \$197.00
 - 32K Static RAM \$599.00
 - 64 Character/line Video \$149.00
- 0 KEM S-100 Motherboard \$155.00
 - includes sockets for 4K 2708 on board*
 - 64 Character/line Video Module \$255.00
 - 8K Static RAM \$197.50
 - 32K Static RAM \$599.00
- 0 HDE Floppy Disk
- 0 PROM Programmers

All items are available from stock.

**JOHNSON
COMPUTER**

P.O. BOX 523
MEDINA, OHIO 44256
(216) 725-4560

✓ J4

INTRODUCING DUAL DRIVE MINIFLOPPY FOR PET!



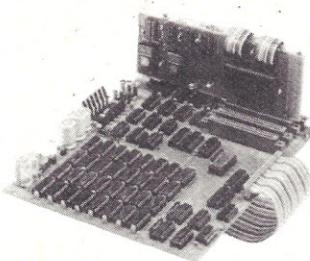
DKH641 IS A PRODUCT OF CONVENIENCE LIVING.

PET COMPUTER



INTERNAL MEMORY EXPANSION FOR PET!

EXPANDAPET™



OPTIONAL PLUG-IN BOARDS 32K UNIT ALLOWS 8K OF
SERIAL I/O BOARD \$75 ASSEMBLY LANGUAGE
S-100 I/O BOARD \$75 SUBROUTINES ACCESSED
4K EPROM BOARD \$50 VIA THE USR COMMAND.

EXPANDAPET IS A PRODUCT OF CONVENIENCE LIVING.

INTERNAL MEMORY EXPANSION UNIT

- * MOUNTS EASILY INSIDE YOUR PET
- * EASY TO INSTALL (15 MINUTES)
- * NO DEGRADATION OF PET SYSTEM
- * USES LOW POWER DYNAMIC RAMS
- * 90 DAY PART & LABOR, 1 YR-RAMS.
- * 30 DAY MONEY BACK GUARANTEE.
- * MOUNTING SLOTS FOR 4 BOARDS.
- * CALL/WRITE FOR ADDITIONAL INFO
- * DEALER INQUIRIES INVITED.

EXPANDAPET PRICES

16K (+8K PET = 24K)	\$425
24K (+8K PET = 32K)	\$525
32K (+8K PET = 40K)	\$615

- * DUAL MINI FLOPPY DRIVE WITH 100K PER DISK SIDE FOR TOTAL 200K ON LINE.
- * DESIGNED FOR COMMERCIAL SPEED REQUIREMENTS *FAST LOADING SPEED.
- * DISKMON™ (DOS) AUTOMATICALLY REORGANIZES FREE DISK SPACE AFTER SAVE OR ERASE.
- * DISKMON IS RESIDENT IN ROM VIA DISK CONTROLLER BOARD PLUGGED INTO EXPANDAPET.*
- * DISKMON ADDS 14 COMMANDS TO BASIC INCLUDING DISK DATA FILES.
- * DISKMON COMMANDS SUPPORT COMMERCIAL PRINTER OFF PARALLEL PORT SUCH AS CENTRONICS 779.
- * FULL DISK SOFTWARE SUPPORT * FORTRAN & PLM COMPILERS THIS JANUARY.
- * 90 DAY MANUFACTURER'S WARRANTY ON HARDWARE*READY TO USE ON DELIVERY. WITH FULL INSTRUCTIONS AND UTILITY DISKETTE.
- * CALL OR WRITE FOR ADDITIONAL INFORMATION * INITIAL QUANTITIES LIMITED.
- * THIS SYSTEM IS FULLY SUPPORTED BY SOFTWARE FROM THE MANUFACTURER.
- * ORDERS ARE NOW BEING ACCEPTED FOR DECEMBER & JANUARY DELIVERY.

DKH641	—DUAL DRIVE SYSTEM, COMPLETE WITH DISKMON \$1295.00
DKL067	—DISKMON ASSEMBLER LISTING/DOS \$19.95
ASM789T	—PET ASSEMBLER ON CASSETTE \$19.95
ASM789D	—PET ASSEMBLER ON DISKETTE (5.5 inch) \$49.95
LNK456	—AUTOLINK LINKING LOADER ON DISKETTE \$49.95
FOR300	—FORTRAN COMPILER ON DISKETTE (JAN'79) \$69.95
PLM400	—PLM COMPILER ON DISKETTE (JAN'79) \$49.95

* * * BUSINESS PACKAGES STARTING IN 1st QUARTER 1979 * * *

* THIS SYSTEM REQUIRES EXPANDAPET MEMORY (MINIMUM 16K—SEE BELOW)

WHY NOT BUY FROM THE BEST?

8K PET \$ 795

24K PET (8 + 16K) \$1210

32K PET (8 + 24K) \$1310

ALL PRICES INCLUDE 48 HR. PRE-SHIPMENT TESTING &

3 FREE CASSETTE PROGRAMS

PRICES SHOWN ABOVE INCLUDE EXPANDAPET. PME MEMORIES WILL HAVE HIGHER PRICING.

- * NEECO IS A CUSTOMER ORIENTED, FULL SERVICE COMPANY.
- * PETS RECEIVE 48 HR. 'BURNIN' BY NEECO BEFORE SHIPMENT.
- * FULL CUSTOMER SERVICE AND FULL PRODUCT SUPPORT.

* 48 HR MAXIMUM 'TURNAROUND' ON PET WARRANTY SERVICE ON PETS PURCHASED FROM NEECO.

* FULL PRE-PURCHASE INFO AVAILABLE FROM OUR PET INFO PACKAGE — WE ANSWER CUSTOMER QUESTIONS!

* AUTOMATIC SOFTWARE/HARDWARE UPDATES VIA OUR PET OWNERS MAILING LIST — CALL/WRITE TO BE LISTED!

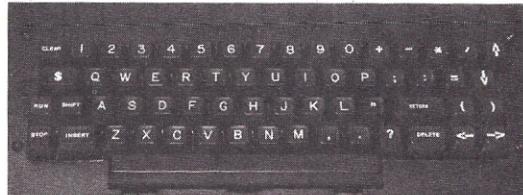
* COMMERCIAL QUANTITIES AVAILABLE.

* WE ALSO MARKET REPLACEMENT RAMS & ROMS, ETC.

* OFF THE SHELF DELIVERIES (NO DEPOSIT REQUIRED).

SCHOOL INQUIRIES INVITED!

FULLSIZED TYPEWRITER KEYBOARD FOR PET!



* COMMERCIAL QUALITY KEYBOARD WITH METAL ENCLOSURE.

* BASIC TYPEWRITER DESIGN FOR TOUCHTYPISTS.

* SINGLE KEY FUNCTIONS FOR ALL CURSOR CONTROLS.

SHIFT/RUN, INSERT, CLEAR SCREEN/HOME CURSOR, MORE.

* FUNCTIONS SIMULTANEOUSLY WITH PET'S KEYBOARD.

* PLUGS DIRECTLY INTO PET'S LOGIC BOARD.

* DOES NOT USE USER OR IEEE-488 PORTS.

* NPK-101 IS FULLY TESTED & READY TO USE.

* ATTACHES DIRECTLY TO FRONT OF PET'S FRAME.

* CAN BE USED AS A REMOTE TERMINAL (SPECIAL ORDER).

* 30 DAYS TRIAL PERIOD * 90 DAY WARRANTY.

* CALL OR WRITE FOR FULL SPECS-INITIAL QTY LIMITED.

ORDERS ARE NOW BEING ACCEPTED FOR DEC/JAN CUSTOMER DELIVERIES.

\$139.95

NPK-101 IS A PRODUCT OF NEW ENGLAND ELECTRONICS.

WE CANNOT LIST ALL OF OUR SOFTWARE AND HARDWARE PRODUCTS
CALL OR WRITE FOR OUR *FREE* SOFTWARE/HARDWARE DIRECTORY
DOMESTIC & OVERSEAS DEALER INQUIRIES INVITED ON * MEMORY * KEYBOARD * SOFTWARE

NEECO

NEW ENGLAND ELECTRONICS CO., INC.
248 BRIDGE ST., SPRINGFIELD, MASS. 01103
MON-FRI 9:30-5:30, SAT 10-2, E.S.T.

N¹²

(413) 739-9626



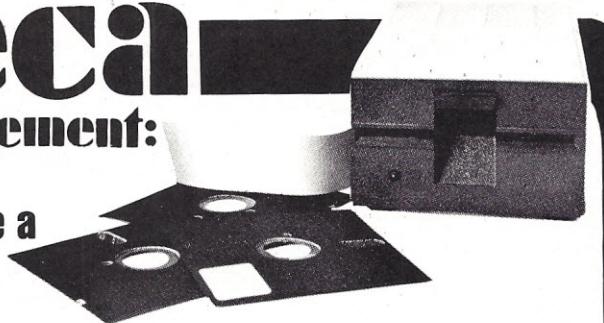
ACCEPTED, ADD 3% SERVICE CHARGE.



MECA

announcement:

Now you can have a 3.5 Megabyte Storage System using low cost Tape and Disk!



MECA provides you with a choice of tape, or disk, or both. Each can be used as a stand-alone system, or together as a FULLY INTEGRATED SYSTEM, providing you up to 3.5 Megabytes of on line storage for your S-100 bus computer.

CAPACITY

- ALPHA-1 Tape System stores over 750K bytes on each side of a C-90 cassette.
- DELTA-1 Disk System uses *double density* which stores up to 200K bytes on 5 1/4" mini-floppy.

SPEED

- ALPHA-1 high speed searches 100 inches per second.
- DELTA-1 worst case search is 1.5 seconds.
- ALPHA-1 Data Transfer Rate is 781 Bytes per Second.
- DELTA-1 Data Transfer Rate is 25,600 Bytes per Second.

SOFTWARE

- Operating System handles variable length named files, is Random Access, Updates, Packs and Copies with a single command. Includes Editor, Assembler and Debugger.
- Microsoft BASIC available in 8K, Extended and Disk Extended BASIC.
- CP/M* available for the DELTA-1.

SYSTEM INCLUDES:

Each drive with its own electronics, controller, power supply, cabling, case, manual and software on cassette or 5 1/4" disk. Wood panels on ALPHA-1 are optional.

NORTH STAR OWNERS

Double your capacity. Upgrade your present system using your SA400 Drive by purchasing the DELTA-1 Control Card and double-density software.

For complete information, phone or write:

MECA ✓ M24

7026 O.W.S. Road, Yucca Valley, CA 92284
(714) 365-7686

*CP/M is a trademark of Digital Group.

SMALL SOFTWARE SYSTEM

TRS - 80 SOFTWARE

THE ELECTRIC PENCIL WORD PROCESSOR—\$99.95

Michael Shrayer's ELECTRIC PENCIL, highly respected as a superior word processor for home computers and small businesses, is now available for the TRS-80! In addition to all standard ELECTRIC PENCIL editing and printing features, this new version offers a transparent cursor, two key rollover, repeating keyboard, upper and lowercase entry and display (after simple modification - documentation included) or upper case only in unmodified TRS-80's. THE ELECTRIC PENCIL runs printers using Radio Shack's expansion interface or will operate RS-232 and 20-mil current loop printers using our TRS232 printer interface. LEVEL-I or LEVEL-II 16K computers may be used. THE ELECTRIC PENCIL opens a whole new world of practical applications for the TRS-80 computer!

* RSM-2D: A NEW MONITOR FOR TRS-80 DISK SYSTEMS!—\$29.95 *

Finally, a monitor for disk users! This new program includes all the features of our popular RSM-1S, plus it reads and writes SYSTEM tapes, has a Z-80 BREAKPOINT routine, reads and writes DISK SECTORS directly, and PRINTS using either the Radio Shack Interface or our own TRS232! Three versions on one disk to load at the top of 16K, 32K or 48K computers.

RSM-1S: A MACHINE LANGUAGE MONITOR FOR THE TRS-80—\$23.95

RSM-1S provides you with 22 commands which interact directly with the Z-80 processor in your TRS-80. You may examine your ROM's, test your RAM, enter and execute machine language programs, read and write machine language tapes, and much more! A SYMBOLIC DEBUG command disassembles object code and displays it as Zilog standard Z-80 mnemonics! Memory may be displayed in HEX or either of two ASCII formats, and can be EDITED, MOVED, EXCHANGED, VERIFIED, FILLED, ZEROED, TESTED, or SEARCHED for one or two-byte codes. Memory display commands may be stepped with SPACE, or aborted with BREAK. Runs in 4K.

AIR RAID: A REAL-TIME TRS-80 SHOOTING GALLERY!—\$14.95

AIR RAID is a game where large and small airplanes fly across the screen at different altitudes. A ground based missile launcher is pointed and fired from the keyboard. Missiles may be guided after launching! Aircraft explode dramatically when hit, sometimes destroying other nearby planes! Score is tallied for each hit or miss, and the highest score is saved to be challenged by other players. AIR RAID provides hours of fun for you, and is a super demonstration program for entertaining friends! Runs in 4K.

TRS - 80 HARDWARE

SMALL HARDWARE SYSTEM ✓ \$51

TRS232 PRINTER INTERFACE—\$49.95 (Assembled and Tested)

The TRS232 is a self-contained software-driven output port and comes complete with cassette software and source listings for driving printers from LEVEL-II or DISK BASIC or machine language programs. Diablo, Teletype, TI Silent or any RS-232 or 20-mil current loop printer may be used with the TRS232. The TRS232 is small (about 1" x 2" x 3") and installs in series with the power and cassette cables on your TRS-80 computer. A standard DB-25 connector mates with the printer cable. The TRS232 may be left in place at all times, since it does not interfere with cassette operation. THE ELECTRIC PENCIL and RSM-2D use the TRS232, thus word processing, BASIC, and machine language applications are supported!

PARA-PORT: 2 1/2 PORT PARALLEL I/O BOARD—\$79.95 (Kit)

Our parallel port board can be used for driving LED light displays, reading external keyboards, polling sense switches, driving parallel port printers, controlling relays for lamps, sprinklers, or any place where control of external devices is desired! Included are two latched 8-bit input and output ports plus a third 4-bit status port so that full handshaking protocol may be established. Requires external 5-volt power supply.

40/44-6: SIX-PACK BUFFERED MINI-MOTHER BOARD—\$99.95 (kit)

A fully buffered mother board to operate up to six plug-in boards. Includes 6 44-pin sockets with card guides, power supply connections, support feet, and a 40 pin ribbon cable to connect to the TRS-80 expansion port. Operate any of our boards, or use readily available 44-pin breadboards to do your own thing! Provisions to allow use of the screen printer or expansion interface are included. Available February 1. A single-slot version (order 40/44-1) is currently available for \$24.95 (\$19.95 with PARA-PORT).

OTHER TRS-80 PRODUCTS

CHESS: \$19.95	Microchess 1.5 plays a good game of chess, uses graphics.
RSL-1: 14.95	Draw patterns on your screen then play the game of LIFE.
ESP-1: 29.95	Editor, assembler, and monitor using INTEL 8080 mnemonics.
LST-1: 8.00	A disassembled listing of LEVEL-1 BASIC with some comments.
SCM-1: 6.00	A fully detailed schematic of the TRS-80 microcomputer.
CVR-1: 6.00	Quality dust covers in cloth-backed vinyl to protect your keyboard. Colors: Spanish Red, Antique Ivory, Rich Brown.

All software shipped postpaid with LEVEL I and LEVEL II versions on the same cassette. Add shipping for hardware items. (Calif. residents add 6% tax).

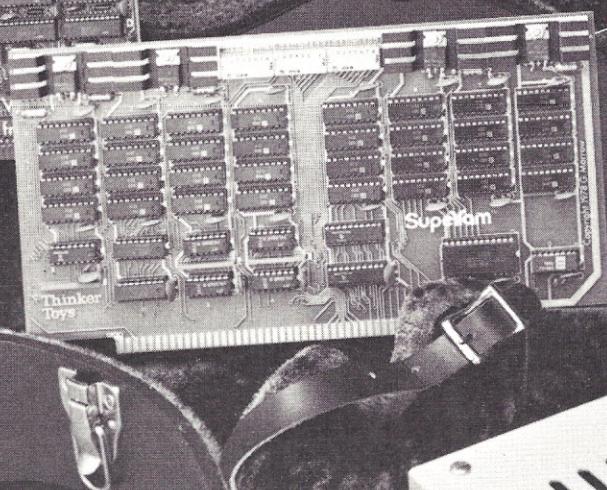
* Small System Software * P.O. Box 366 * Newbury Park, Calif. 91320 *

* Small System Software * P.O. Box 366 * Newbury Park, Calif. 91320 *

ECONORAM™ III with **Synchrofresh™ 8K** dynamic memory is the only dynamic with refresh that weaves itself invisibly into natural timing of the S-100 bus. Assembled, burned-in, tested and warranted 1 year to be as reliable as any static. **\$149.**



SUPERRAM™ 16K static memory is configured as four 4K blocks, each addressable and write-protectable. High-efficiency design is uncrowded, meets Proposed IEEE S-100 Standard with all signals fully buffered. Complete kit with solder mask and parts legend for easy assembly. Great quality at just **\$299.**



George Morrow is The Big Man in S-100 memory. He designed the first big breakthrough in S-100 memory prices, the best-selling ECONORAM™ 4K. Now, Morrow's MicroStuff makes the only line of S-100 memory products that goes all the way from 8K boards to full-size floppy disk systems.

And every one of the Morrow's MicroStuff memory products kills its competition. In quality. In features. In performance. And in price.

Ask anyone about Morrow memories. The 1978 Image Profile study of microsystem owners found Morrow one of the four best-known names in accessories.

Morrow memories are accessories after your facts. Made by Morrow's MicroStuff and distributed exclusively by Thinker Toys,™ you can find them at more than 150 computer shops throughout the U. S. Ask your nearest computer store to order for you.

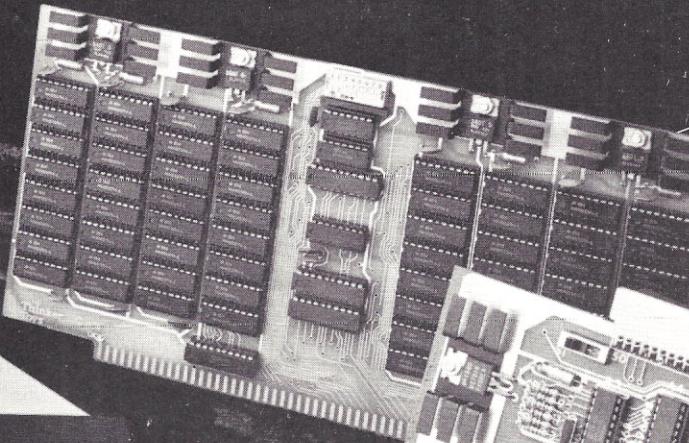
Or order directly from Thinker Toys,™ 1201 10th St., Berkeley, CA 94710. Call (415) 524-2101 10-4 Pacific Time. (Direct orders include \$7 handling for Discus I, other products add \$3; Cal res. add tax.)

Morrow makes memory for

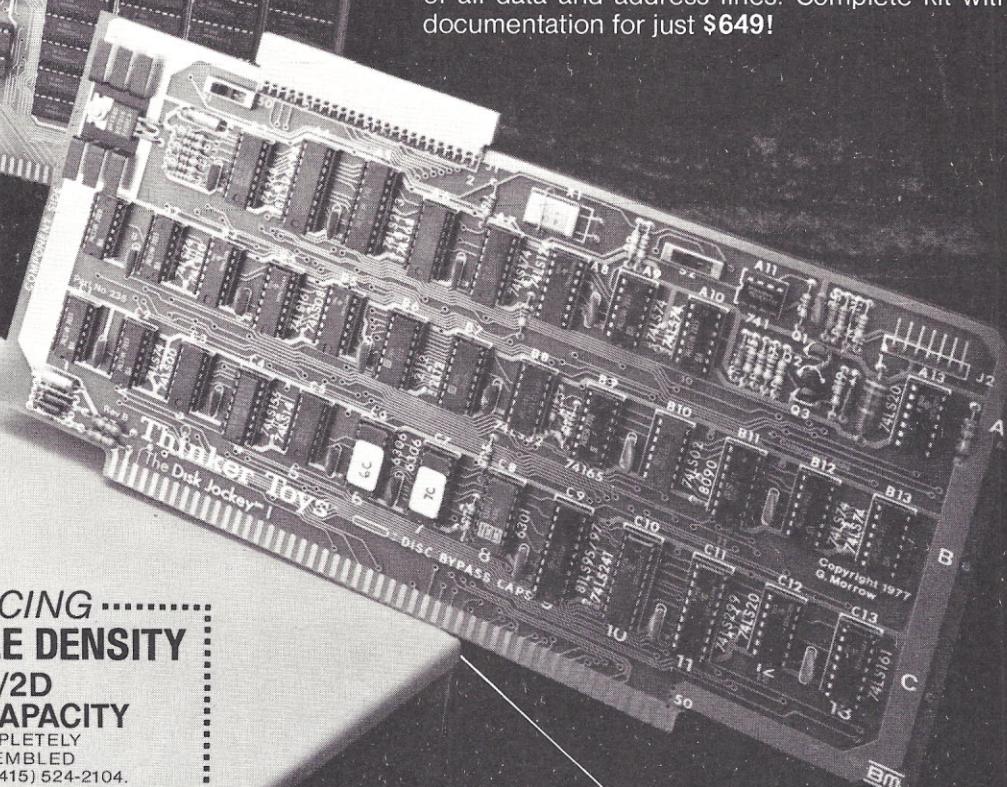


Thinker Toys™

...in S-100 memory.
Morrow's got you covered.



SUPERRAM™ 32K static memory is the latest Morrow Breakthrough in S-100 memory design, using only 7 ICs for control. Configured as two 16K blocks, each addressable and write-protectable. Meets the Proposed IEEE S-100 Standard including full buffering of all data and address lines. Complete kit with full documentation for just **\$649!**



ANNOUNCING
DOUBLE/SINGLE DENSITY
DISCUS/2D
600K BYTE CAPACITY
\$1149 COMPLETELY
ASSEMBLED
FOR DETAILS CALL (415) 524-2104.

DISCUS I™ full-size disk system features IBM-compatible 250,000-byte format. System delivered fully assembled, tested and warrantied including: Shugart 800R disk drive in cabinet with power supply, 8-disk capacity S-100 controller with on-board serial I/O port, all cables and connectors, and complete software package. Complete system, **\$995**. Mounted Shugart 800R drive only, **\$795**. Optional: Micro-Soft Extended Disk BASIC, **\$199**. Micro-Soft FORTRAN, **\$349**. CP/M* **\$70**.

*CP/M is a trade mark of Digital Research.
†ECONORAM is a trade mark of GODBOUT Electronics.

Keeping Ma Bell Happy

Pleasing mother monopoly isn't always easy, but here are some dos and don'ts that will help to keep her from slapping your interface.

Shortly after I started personal computing, it occurred to me that my computer had the potential to be a powerful tool in my work. However, I didn't want to carry the whole system back and forth from my office. My wife had written a program to estimate the cost of printing books and, when necessary, wanted to be able to access the program from her of-

fice. The solution to our dilemma was apparent—use the telephone system to communicate with the computer via a portable terminal and modem.

In fact, as I began to think about adding a modem, all sorts of applications came to mind. From work, I could direct the computer to turn something on or off at home or periodically monitor the status of the

house. I could offer to share some time on my computer with a friend. Maybe I would have the computer periodically call up one of those stock-price services, sample the price of some selected stocks and run the data through a stock-market analysis program. I could even have some space war games in which my computer and I could play against

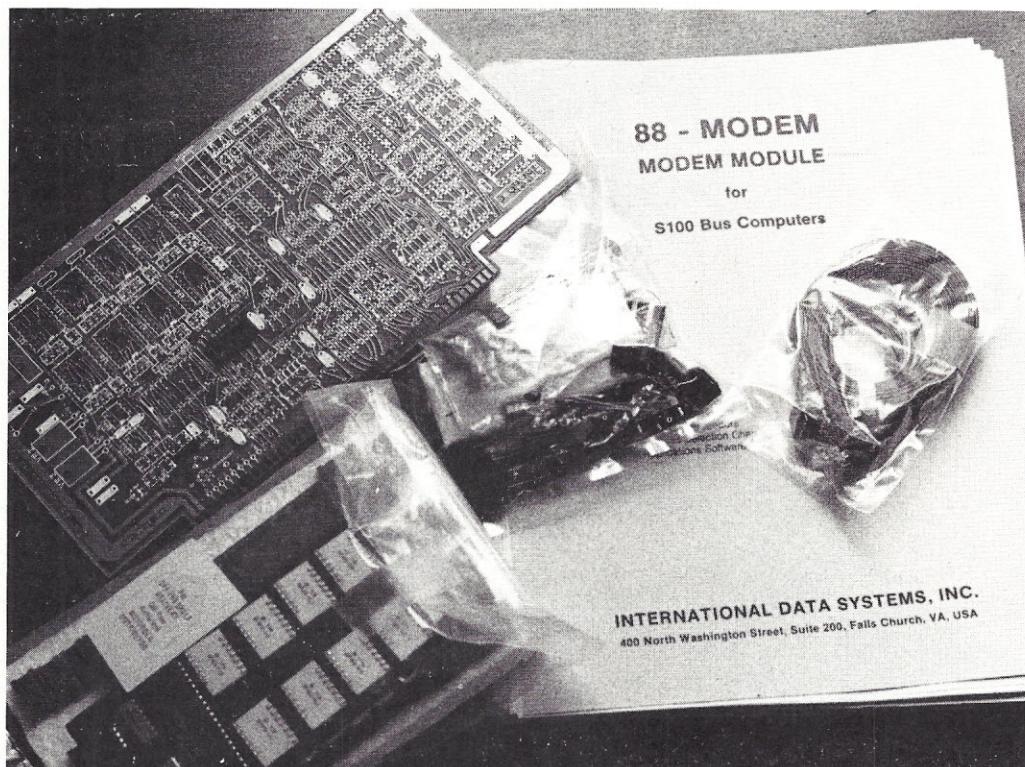
someone else and his computer with the phone supplying the data link.

Well, it took a year for my dreams to reach fruition. It took that long because I started with no knowledge about what I needed to get a modem up and running on my Altair 8800. I now have the knowledge, and I am about to share it with you.

There are modems and there are modems. I wanted mine to answer an incoming call and connect the calling terminal to the computer "unattended." That is, the modem and computer would answer the call by itself. This type of modem, connected directly to the phone line, is called an *automatic answer/originate modem*.

There are two types of automatic modems available to the hobbyist for connection to the voice-band telephone network: the stand-alone RS-232 type, such as the Bell Dataphone 103, and the S-100-bus-compatible modem board. The Dataphone 103 rents for about \$35 to \$40 per month from the phone company.

It is relatively easy to interface (at least for operation in an automatic answer mode). All you need to do is connect an RS-232 input/output port on your computer to a corresponding port on the modem. Once the modem is connected to the computer, calling into the



The 88-Modem board before assembly.

modem via a portable terminal causes everything to behave as if the terminal were connected directly to the computer via an RS-232 connection.

The S-100-bus-compatible modem boards, on the other hand, require more software linking with the computer. They behave like a serial input/output board and are controlled and addressed in a similar manner. As a result, the S-100 boards can be made to do more under computer control, such as automatically dialing a phone number.

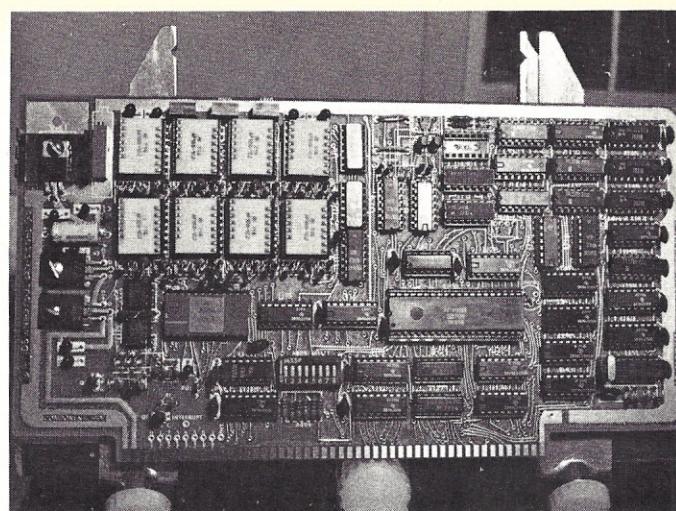
For my purposes, I decided to buy an S-100-bus-compatible modem board; specifically, the International Data Systems 88-Modem kit (\$245). The 88-Modem kit is not intended for beginners. Although the instruction manual is clearly written and detailed (over 100 pages), the board uses very high density mounting of components. For example, the resistors are mounted vertically to conserve space. The kit is of very high quality; however, it arrived without two capacitors and an errata sheet. International Data Systems had the missing parts in my hands a few days later and, in five evenings, I had the kit assembled.

Even though the kit was assembled, I could not connect the modem to the phone lines. The instruction manual explained that the board could only be connected to the telephone system via a *CBT data access arrangement*. Without the CBT I couldn't even test whether the modem was operating properly. Why couldn't I just connect the modem directly to the phone line?

Besides the fact that the modem requires some of the circuitry in the CBT to operate as intended, it's against federal law!

I learned that the FCC regulates the phone system much as they regulate radio and television transmission. Part 68 of the FCC's regulations lists detailed technical requirements for the connection and operation of data communication equipment using the telephone system. These regulations not only apply to equipment that is directly wired to the phone system, but also to equipment that is *acoustically or inductively* coupled to the phone system.

They specify frequency bands, certain timing requirements and power levels within which the communication equipment must operate. Failure to abide by these technical requirements can cause signal interference in your neighbor's phone; damage to your computer, modem or the telephone system; billing errors; transmission interruptions; and activation of certain telephone company circuitry, resulting in poor



The final product.

data transmission. The FCC regulations allow the phone company to discontinue service to subscribers who fail to obey the rules. In fact, state laws provide for criminal penalties for certain violations.

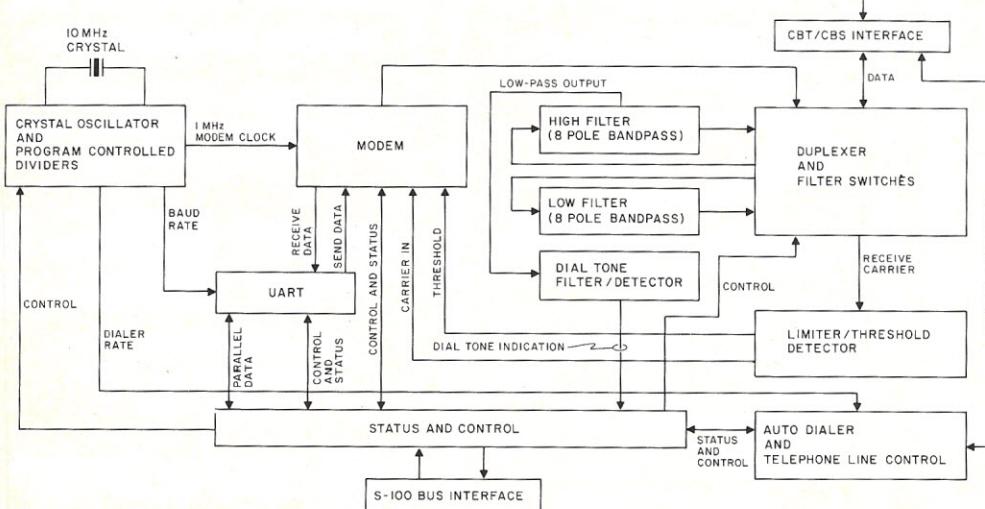
In short, I decided to hook up my modem legally via the CBT specified by the International Data Systems instruction manual. The manual listed two ways of obtaining the proper CBT: I could purchase the device from IDS with the necessary phone jack for \$125, or I could rent one from the phone company. I decided to find out what the phone company's rental price was, so I called their residential service office.

After spending 20 minutes explaining to a representative that I owned a computer and modem and wanted to know the monthly rental rate for a CBT (the representative initially responded, "What's a CBT?"), I was told I would have to call a data-service representative for that information.

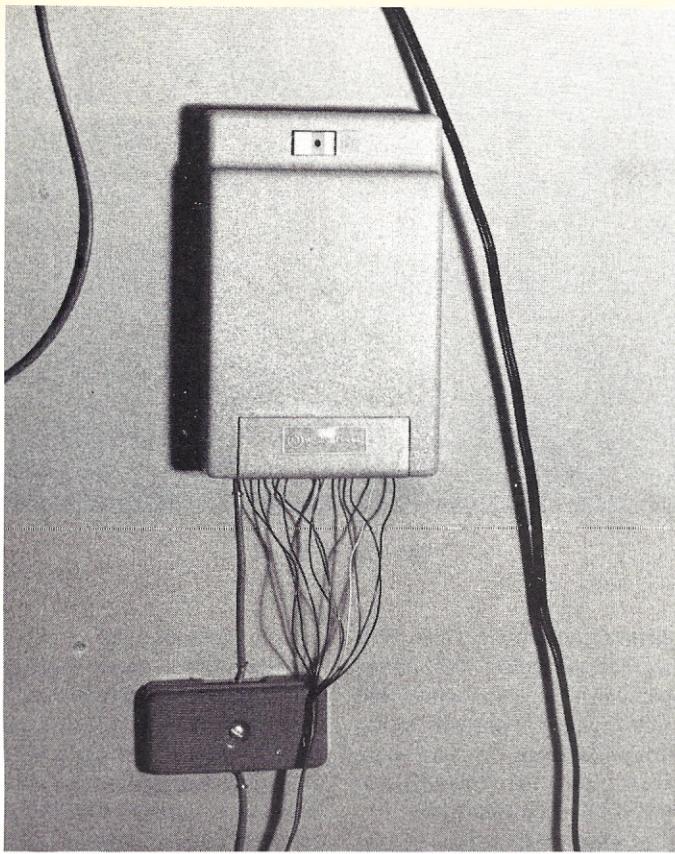
The data-service representative was helpful and explained that the CBT rented for \$4 a month. However, he told me that all the phones on the line would have to be changed to special phones designed to be operated with a CBT. (These special phones have a switch that disables the CBT when the phones are being used.) He also explained that these phones could not be connected via phone jacks.

As an alternative, he suggested that I might consider adding an additional telephone line. The lowest priced phone line available was an "incoming calls only" supplemental residential line for \$7 a month. Although I also planned to call out on my modem in the future, I decided that the savings might be worth only being able to call into the computer. The total cost of a Bell CBT would be \$11 a month plus a one-time \$25 installation fee.

The phone company representative said that the CBT couldn't be installed for a month! A month later the installers arrived (also mumbling, "What's a CBT?"), and by the



Block diagram of the system.



The Bell System CBT—necessary to connect the 88-Modem to the phone system.

end of the day they had the CBT installed. However, I still couldn't use the modem because it still had to be patched into my Altair's BASIC interpreter.

You see, the 88-Modem can be operated in several modes under software control. The

modem occupies four consecutive input/output addresses. These addresses are used to control the number of bits and stop bits, parity, the proper transmission frequencies for originate or answer mode operation, length of time after loss of signal before the modem dis-

connects from the line, baud rate, and some other user-selected functions, as well as providing for data input and output.

Other addresses provide status signals which indicate that data either can be transmitted or has been received, whether the on-board automatic dialer is in the process of dialing, whether the remote terminal has transmitted a command to break transmission, whether a remote modem is connected to the other end of the line, and whether a dial tone has been detected.

The IDS instruction manual provided the necessary machine-language data handler and patches for Altair 3.2 and 4.08K BASIC. The data handler, when patched to BASIC, sets up the on-board UART for the specified bit number and rate and changes the frequencies to the proper values for operation in the answer mode. The handler then checks to see if the phone is ringing via the status addresses. If the phone is ringing, the modem answers, puts a tone on the line to disable the phone company's echo suppressors and listens for a remote modem at the other end of the line.

I entered the patch provided for 4.08K BASIC, called into the modem from my other phone line (another good reason for

having a second line installed) with a portable terminal, and nothing happened! The modem had answered the phone, but when I typed on the terminal, the modem hung up.

After several hours of troubleshooting I found the problem. My portable terminal was set for a transmission rate of 110 baud with two stop bits, while the IDS data handler was setting the modem to 300 baud with one stop bit. I modified the software and tried again. This time it worked! After a year of planning, I finally had a working auto answer/originate modem.

As a footnote: In preparing this article, I learned an interesting fact—not all modems sold to hobbyists conform to FCC regulations. (The IDS 88-Modem, when connected to a properly installed CBT data-access arrangement, does conform to all regulations.) Also, if you decide to buy a CBT for interconnection and install it yourself, you must inform the phone company to what line it is connected, the FCC registration number of the CBT, the ringer equivalence number and what type of modular jack is being used to connect the CBT to the phone line. The only way you can legally connect any equipment yourself is by plugging the equipment into a phone-company-installed jack. ■

Canadian 8K MEMORY KITS

M1—Fast Signetics 21L02-1 RAMs with 20 pages of Documentation—solder mask Low power Schottky—S-100 Bus—Full Buffering \$179.95

M2—as above with DIP switch address select and Robinson Nugent IC sockets only \$199.95

MEM1—WAMECO bare board as used in above kits \$39.95

Write for info on WAMECO CPU and other S-100 bare boards.

ORTHON COMPUTER
(ORTHON HOLDINGS LTD.)
✓ 08

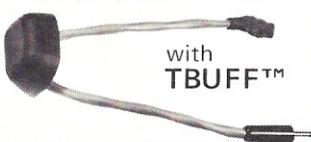
12411 Stony Plain Rd
Edmonton, Alberta Canada T5N3N3

WEB ASSOCIATES

GET UNSTUCK!

on your

TRS-80™



STOP YOUR CASSETTE WHEN IT SHOULD WITH OUR
PLUG-IN TBUFF™ CASSETTE INTERFACE BUFFER
Only \$7.95 ea.

—ALSO—

TEBED IT™ (Renumeres, saves sections, places multiple
programs in memory, merges subroutines . . . \$24.95 ea.

SEVERAL MONITORS AVAILABLE

TEMONTM @ 4200 HEX \$12.95 ea.

TEMON TTM * \$14.95 ea.

*(Top of RAM monitor—specify memory size)

Buy any two or more monitors for \$12.75 ea.

For more information circle ✓W20

Send check or money order to:

WEB ASSOCIATES
P.O. Box 60-M Monrovia, CA 91016
(California Residents add 6% tax)

TELETYPE MODEL 33 ASR

COMPUTER I/O COMPLETE WITH:

- Tape Punch • Ready to Go
- Tape Reader • Line/Local Wired
- Guaranteed 30 Days

\$840.00

INCLUDING PACKING
F.O.B. N.J. FACTORY

COMPLETE COVER READY TO INSTALL	\$ 36.00
COPY HOLDER (112036)	\$ 14.00
TAPE UNWINDER (12" NEW)	\$ 6.00
WIRELESS KEYBOARD (112037)	\$ 12.00
ELECTRIC PAPER WINDER (LPW-300 NEW)	\$ 50.00
DEC TYPE READER RUNCARD	\$ 45.00
ACQUITY COVERS	\$ 15.00
OMNITEK 301A (NEW)	\$ 180.00
READER POWER PACK (182134)	\$ 25.00
EIA RS-232 INTERFACE	\$ 25.00
ACQUITY COVERS WITH FAN (NEW)	\$ 25.00

If its for TELETYPE® We Have It.

If you don't see what you need

CALL or WRITE!



TELETYPEWRITER COMMUNICATIONS SPECIALISTS
550 Springfield Avenue • Berkeley Heights, N. J. 07922
(201) 464-5310 • TWX: 710 886-3016 • TELEX: 13-6479

✓ T13 SUBSIDIARY OF VAN'S W2DLT ELECTRONICS.



OSBORNE & ASSOCIATES, INC.

The World Leaders in Microprocessor Books

Program Books Written in BASIC

Payroll with Cost Accounting

Accounts Payable and

Accounts Receivable

General Ledger

These books feature complete, quality applications software for small-to-medium sized businesses. Each book includes fully documented program listings, sample printed reports, installation instructions and user's manual. Written in an extended Wang BASIC (write to ask us about our CP/M CBASIC version and other conversion). 375 pages each.

Payroll #09-8 \$15.00
AP & AR #13-6 \$15.00
G. Ledger #20-9, orders now being accepted

Some Common BASIC Programs

76 short practical programs, most of which can be used on any microcomputer with any version of BASIC. Complete with program descriptions, listings, remarks and examples. 200 pages. #06-3 \$8.50

Assembly Language Programming

8080A/8085

Assembly Language Programming

6800 Assembly Language Programming

Z80 Assembly Language Programming

6502 Assembly Language Programming

These books describe how to program a microcomputer using assembly language. They discuss classical programming techniques, and contain simplified programming examples relevant to today's microcomputer applications. 400 pages each.

8080A/8085 ALP #10-1 \$8.50
6800 ALP #12-8 \$8.50
Z80 ALP #21-7, available soon
6502 ALP not yet available

If you want information
on microprocessors,
read the Osborne
books.

Programming for Logic Design

8080 Programming for Logic Design

6800 Programming for Logic Design

Z80 Programming for Logic Design

These books describe the meeting ground of programmers and logic designers; written for both, they provide detailed examples to illustrate effective usage of microprocessors in traditional digital applications. 300 pages each.

8080 PFLD #04-7 \$8.50
6800 PFLD #05-5 \$8.50
Z80 PFLD #11-X \$8.50

An Introduction to Microcomputers

Volume 0 - The Beginner's Book

If you're not familiar with computers, but would like to be, then this is the book for you. Computer logic and terminology are introduced in a language the beginner can understand. Computer software, hardware and component parts are described, and simple explanations given for how they work. Text is supplemented with creative illustrations and numerous photographs. 300 pages. #08-X \$7.95

Volume 1 - Basic Concepts

A must for anyone in the computer field, this best selling text explains hardware and programming concepts common to all microprocessors. Its universal appeal is reflected by its having the greatest yearly sales volume of any computer text. 350 pages. #02-2 \$8.50

Volume 2 - Some Real Microprocessors

Volume 3 - Some Real Support Devices and update subscriptions

These two books provide complete descriptions of virtually every microprocessor and most support devices. There are no other books like these; they provide detailed part descriptions from an independent source.

To cope with the rapid evolution of microprocessor products, each volume has its own series of six bimonthly updates, allowing you to remain current with all parts as soon as they are really available. Update subscriptions sold separately.

These two books replace the 1977 edition of Volume II - Some Real Products. Volume 2, 1400 pages; Volume 3, 700 pages; printed loose leaf.

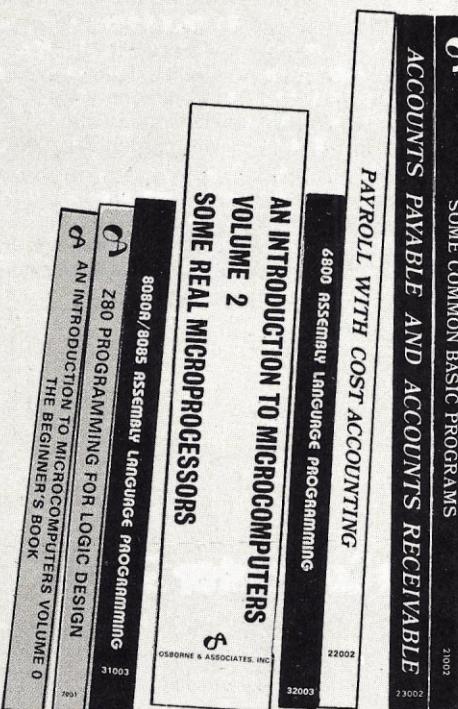
Volume 2 with binder #14-4 \$20.00 now \$30.00 1/1/79*

Volume 3 with binder #17-9 \$20.00

Volume 2 update only \$25.00/yr.

Volume 3 update only \$25.00/yr.

Volume 2 and 3 updates \$40.00/yr.



Osborne & Associates, Inc.
P.O. Box 2036, dept. D9A
Berkeley, CA 94702 USA

(415) 548-2805
TWX 910-366-7277

NAME _____

ADDRESS _____

CITY _____ STATE _____

ZIP _____ PHONE _____

Please send the following information:
 Becoming an O&A dealer
 School discounts
 List of foreign distributors
 More information on O&A books

Please notify me when available:
 Z80 Assembly Language Programming
 6502 Assembly Language Programming

Payment in advance must be enclosed for purchases of up to \$70.00. Invoicing U.S. purchases over \$70.00 available upon approval of your account. All foreign orders must be prepaid in U.S. dollars drawn on a U.S. bank.

TITLE	PRICE	QUANTITY	AMOUNT

SHIPPING (Shipping for large orders to be arranged)

Vol. 2 and Vol. 3 update subscriptions:

All foreign orders \$4.00 per 6-issue subscription for airmail
 No charge in the U.S. - 4th class mail ONLY

shipping
 TOTAL
 AMOUNT ENCLOSED

Books:

All foreign orders \$3.00 per book for airmail
 \$0.35 per book 4th class (allow 2-3 weeks in the U.S.)
 \$0.75 per book UPS in the U.S. (allow 10 days)
 \$1.50 per book special rush shipment by air in the U.S.

California residents tax
 Calif. residents add 6% sales tax.
 S.F. BART residents add 6-1/2 % sales tax.

*Price increase applies to orders postmarked on or after January 1, 1979.

TRS-80

PET

APPLE



PLAY CHESS WITH

MICROCHESS is the culmination of two years of chessplaying program development by **Peter Jennings**, author of the famous 1K byte chess program for the KIM-1. **MICROCHESS 2.0** for 8K PETs and 16K APPLES, in 6502 machine language, offers 8 levels of play to suit everyone from the beginner learning chess to the serious player. It examines positions as many as 6 moves ahead, and includes a chess clock for tournament play. **MICROCHESS 1.5** for **BRIDGE CHALLENGER** by **George Dulsman** for 8K PETs, Level II 16K TRS-80s, and 16K APPLES: You and the dummy play 4 person Contract Bridge against the computer. The program will deal hands at random or according to your criterion for high card points. You can review tricks, swap sides or replay hands when the cards are known. No longer do you need 4 people to play! \$14.95

ORDERS: Check, money order or VISA/Master Charge accepted; programs and cassettes guaranteed. If you have questions, please call us at 617-783-0694. If you know what you want and have your VISA/MC card ready, you can **DIAL TOLL FREE 1-800-325-6400** (24 hours, 7 days; in Missouri, dial 1-800-342-6600). Or you can

YOUR COMPUTER!

4K TRS-80s, in Z-80 machine language, offers 3 levels of play (both Level I and Level II versions are included and can be loaded on any TRS-80 without TBUG). **MICROCHESS** checks every move for legality and displays the current position on a graphic chessboard. You can play White or Black, set up and play from special board positions, or even watch the computer play against itself! Available now at a special introductory price of only \$19.95

STIMULATING SIMULATIONS by **Dr. C.W. Engel** for 8K PETs, 4K Level I and II TRS-80s, and APPLES with Applesoft II: Ten original simulation games such as Forest Fire, Lost Treasure, Gone Fishing and Diamond Thief, progressing from elementary to quite complex with most suitable for schoolchildren. Includes a 64 page book giving flowcharts, listings and suggested modifications ... \$14.95

mail your order to the address below. **Personal Software™** products are now available at all Radio Shack® stores throughout the United States and Canada, and from the PET and APPLE dealers listed below. New dealers are being added daily. For the name and address of a dealer near you, call us at 617-783-0694 today!

Radio Shack®

ALASKA

ALPHA ELECTRONICS
601 E. Northern Light Blvd.
Anchorage, AK 99503

CALIFORNIA

ADVANCED COMPUTER PRODUCTS
1310 B East Edinger
Santa Ana, CA 92705

BYTE SHOP

87 Marina Center

Suisun, CA 94585

CAPITOL COMPUTER SYSTEMS

3396 El Camino Ave.

Sacramento, CA 95616

MARIN COMPUTER CENTER

70 Skyview Terrace

San Raphael, CA 94903

RAINBOW COMPUTING

10723 White Oak Ave.

Granada Hills, CA 91344

SMALL SYSTEM SOFTWARE

2178 Hood Dr.

Thousand Oaks, CA 91360

WASHINGTON D.C.

COMPUTER CABLEVISION

2617 42nd St. NW #2

Washington, D.C. 20007

FLORIDA

FOCUS SCIENTIFIC ENTERPRISES

1601 Biscayne Blvd.

Miami, FL 33132

the Computer Store™

MICROCOMPUTER SYSTEMS

144 S. Del Mabry Hwy.
Tampa, FL 33609

ILLINOIS

EMMANUEL B. GARCIA JR.
AND ASSOCIATES
3950 N. Lake Shore Dr. #2310
Chicago, IL 60613

MASACHUSETTS

THE COMPUTER STORE, INC.
120 Cambridge St.
Burlington, MA 01803

NEW ENGLAND ELECTRONICS
248 Bridge St.
Springfield, MA 01103

THE COMPUTER FACTORY
485 Lexington Ave.
New York, NY 10017

LONG ISLAND COMPUTER
GENERAL STORE
103 Atlantic Ave.
Lynbrook, NY 11563

MICHIGAN

COMPUTERLAND
29673 Northwestern Hwy.
Southfield, MI 48034

COMPUTER MART OF ROYAL OAK
1800 W. Fourteen Mile Rd.
Royal Oak, MI 48073

LEVEL FOUR PRODUCTIONS
32020 Cheboygan
Westland, MI 48185

NEW DIMENSIONS IN COMPUTING
541 E. Grand River
East Lansing, MI 48823

OHIO

NEWMAN COMPUTER EXCHANGE
1250 N. Main St.
Ann Arbor, MI 48104

MINNESOTA

COMPUTERLAND
8070 Morgan Circle Dr.
Bloomington, MN 55431

NEW YORK

THE COMPUTER CORNER
White Plains Mall
200 Hamilton Ave.
White Plains, NY 10601

THE COMPUTER FACTORY
485 Lexington Ave.
New York, NY 10017

COMPUTER MICROSYSTEMS
1311 Northern Blvd.
Manhasset, NY 11030

LONG ISLAND COMPUTER
GENERAL STORE
103 Atlantic Ave.
Lynbrook, NY 11563

NORTH CAROLINA

BYTE SHOP
218 N. Elm St.
Greensboro, NC 27401

COMPUTERLAND
3915 E. Independence
Charlotte, NC 28205

MICROCOMPUTER SERVICES
108-110 Arcade Bldg.
Hickory, NC 28601

ASTRO VIDEO ELECTRONICS
504 E. Main St.
Lancaster, OH 43130

OKLAHOMA

BUSINESS MICRO SYSTEMS
7228 W. Reno, Rte. 5
Oklahoma City, OK 73108

PENNSYLVANIA

A B COMPUTERS
c/o Innemark
1411 Callowhill
Perkasie, PA 18944

TENNESSEE

COMPUTER LABS OF MEMPHIS
627 S. Mendenhall
Memphis, TN 38117

TEXAS

COMPUTER TERMINAL
2101 Myrtle
El Paso, TX 79901

UTAH

THE HI-FI SHOP
4680 Holiday Blvd.
Salt Lake City, UT 84117

VIRGINIA

THE COMPUTER PLACE
2718 Colonial Ave.
Roanoke, VA 24015

COMPUTERS PLUS
678 S. Pickett St.
Alexandria, VA 22304

COMPUTER HARDWARE STORE
818 Franklin St.
Alexandria, VA 22314

HOME COMPUTER CENTER

12588 Warwick Blvd.
Newport News, VA 23606

WASHINGTON

YE OLDE COMPUTER SHOPPE
1301 George Washington
Richland, WA 99352

CANADA

COMPUTER INNOVATIONS
36 Beechmont Crescent
Ottawa, Ontario K1B 4A8

KOBETEK SYSTEMS
RR #1 Wolfville
Nova Scotia B0P 1X0

ENGLAND

BYTE SHOP
426-428 Cranbrooke Rd.
Gants Hill, Ilford, Essex

PETSOFT SALES
P.O. Box 9
Newbury, Berkshire RG13 1PB

GERMANY

ING. W. HOFACKER GMBH
8 Munchen 75
Postfach 437

NETHERLANDS

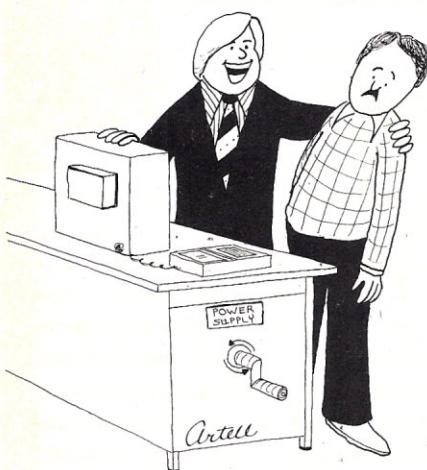
COMPUTRON
P.O. Box 18663
Den Haag 2502 ER

P.O. Box 136-K1

Personal Software™ Cambridge, MA 02138



"OK, Curtin, what did you do with the rest of my goods?"



"And I guarantee you won't find a computer system that's more energy-efficient."

HOBBISTS! ENGINEERS! TECHNICIANS! STUDENTS!

Write and run machine language programs at home, display video graphics on your TV set and design microprocessor circuits—the very first night—even if you've never used a computer before!

ELF II featuring RCA COSMAC COMPUTER \$99.95

As featured in **POPULAR ELECTRONICS**

Shown with optional 4k Memory Boards, **GIANT BOARD™** & Kluge Board.

Stop reading about computers and get your hands on one! With ELF II and our new *Short Course* by Tom Pittman, you can master computers in no time at all! ELF II demonstrates all 91 commands an RCA 1802 can execute and the *Short Course* quickly teaches you how to use each of the 1802's capabilities.

ELF II's video output lets you display an alphanumeric readout or graphics on any TV screen or video monitor plus enjoy the latest video games, including an exciting new target/missile gun game that was specifically developed for ELF II.

But that's not all. Once you've mastered computer fundamentals, ELF II can give you POWER with add-ons that are among the most advanced found anywhere. No wonder IEEE chapters plus hundreds of universities and major corporations have chosen the ELF II to introduce their students and personnel to microprocessor computing!

Learn The Skill That May Soon Be Far More Important Than Your College Degree!

The ability to use a computer may soon be more important to your earning power than a college degree. Without a knowledge of computers, you are always at the mercy of others when it comes to solving highly complex business, engineering, industrial and scientific problems. People who understand computers can command MONEY and to get in on the action, you must learn computers. Otherwise you'll be left behind.

ELF II Is The F-A-S-T Way To Learn Computer Fundamentals!

Regardless of how minimal your computer background is now, you can learn to program a computer in almost no time at all. That's because Netronics has developed a special *Short Course on Microprocessor And Computer Programming* in non-technical language that leads you through every one of the RCA COSMAC 1802's capabilities so you'll understand everything ELF II can do...and how to get ELF II to do it!

All 91 commands that an 1802 can execute are explained to you, step-by-step. The text, written for Netronics by Tom Pittman, is a tremendous advance over every other programming book in print.

Keyed specifically to the ELF II, it's loaded with "hands on" illustrations. When you're finished, ELF II and the 1802 will no longer hold any mysteries to you.

In fact, not only will you be able to use a personal computer creatively, you'll also be able to read magazines such as BYTE...INTERFACE AGE...POPULAR ELECTRONICS and PERSONAL COMPUTING and understand the articles.

If you work with large computers, ELF II and our *short Course* will help you to understand what makes them tick.

A Dynamite Package For Just \$99.95!

With ELF II, you learn to use machine language—the fundamental language of all computers. Higher level languages such as

NOW AVAILABLE FOR ELF II—

- Tom Pittman's *Short Course On Microprocessor & Computer Programming* teaches you just about everything there is to know about ELF II or any RCA 1802 computer. Written in non-technical language, it's a learning breakthrough for engineers and laymen alike. \$5.00 postpaid!
- Deluxe metal cabinet with plexiglas dust cover for ELF II, \$29.95 plus \$2.50 p&h.
- ELF II connects to the video input of your TV set. If you prefer to use your antenna terminals, order RF Modulator, \$8.95 postpaid.
- GIANT BOARD™ kit with cassette I/O, RS 232-C/TTY I/O, 8-bit P I/O, decoders for 14 separate I/O instructions and a system monitor/kit, \$39.95 plus \$2 p&h.
- Kluge (Prototype) Board accepts up to 36 IC's. \$17.00 plus \$1 p&h.
- 4k Static RAM kit. Addressable to any 4k page to 64k. \$89.95 plus \$3 p&h.
- Gold plated 86-pin connectors (one required for each plug-in board). \$5.70 postpaid.
- Professional ASCII Keyboard kit with 128 ASCII upper/lower case set, 96 printable characters, onboard regulator, parity, logic selection and choice of 4 handshaking signals to mate with almost any computer. \$64.95 plus \$2 p&h.

SEND TODAY!

Deluxe metal cabinet for ASCII Keyboard, \$19.95 plus \$2.50 p&h.

ELF II Tiny BASIC on cassette tape. Commands include SAVE, LOAD, ±, ×, ÷, (), 26 variables A-Z, LET, IF/THEN, INPUT, PRINT, GO TO, GO SUB, RETURN, END, REM, CLEAR, LIST, RUN, PLOT, PEEK, POKE. Comes fully documented and includes alphanumeric generator required to display alphanumeric characters directly on your TV screen without additional hardware. Also plays tick-tac-toe plus a drawing game that uses ELF II's hex keyboard as a joystick. 4k memory required. \$14.95 postpaid.

Tom Pittman's *Short Course on Tiny BASIC* for ELF II, \$5 postpaid.

Expansion Power Supply (required when adding 4k RAM). \$34.95 plus \$2 p&h.

ELF-BUG™ Deluxe System Monitor on cassette tape. Allows displaying the contents of all registers on your TV at any point in your program. Also displays 24 bytes of memory with full addresses, blinking cursor and auto scrolling. A must for the serious programmer! \$14.95 postpaid.

Coming Soon: A-D, D-A Converter, Light Pen, Controller Board, Color Graphics & Music System...and more!

Call or write for wired prices!

Netronics R&D Ltd., KB-1

333 Litchfield Road, Phone

New Milford, CT 06776 (203) 354-9375

Yes! I want to run programs at home and have enclosed: \$99.95 plus \$3 postage

& handling for **RCA COSMAC ELF II Kit**.

\$4.95 for power supply (required).

\$5 for RCA 1802 User's Manual, \$5 for *Short Course on Microprocessor & Computer Programming*.

I want mine wired and tested with power supply, RCA 1802 User's Manual and *Short Course* included for just \$149.95 plus \$3 p&h!

I am also enclosing payment (including postage & handling) for the items checked at the left.

Total Enclosed (Conn. res. add tax) \$ _____ Check here if

you are enclosing Money Order or Cashier's Check to expedite shipment.

USE YOUR VISA Master Charge

(Interbank # _____)

Account # _____

Signature _____ Exp. Date _____

PHONE ORDERS ACCEPTED (203) 354-9375

Print _____

Name _____

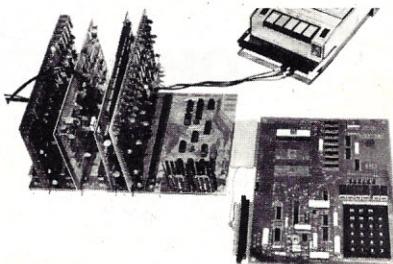
Address _____

City _____

State _____ Zip _____

DEALER INQUIRIES INVITED

KIMSI



The KIM to S-100 bus Interface/Motherboard

- Combines the power of the 6502 with the flexibility of the S-100 bus
- Attaches to any unmodified KIM
- Complete interface logic and fully buffered motherboard in one unit
- On-board regulation of power for KIM
- Eight slots of S-100 compatibility for additional RAM, Video and I/O boards, PROM Programmers, Speech processors...
- Includes all parts, sockets for ICs, one 100 pin connector, and full Assembly/Operating documentation
 - Kit \$125, Assembled \$165
 - All units shipped from stock

FORETHOUGHT PRODUCTS



87070 Dukhobar Rd. #H
Eugene, OR 97402 (503) 485-8575



✓ F8

SHOULD it be a Heathkit®?

Whether you are considering the purchase of your first computer or an additional peripheral, you should know more about Heathkit® computer products. The Heath Company is the only firm with a continuing commitment to supplying personal computers in kit form. While small business applications will also be addressed by Heath® they will not forsake the hobbyist.

That's why you should subscribe to Buss: The Independent Newsletter of Heath Co. Computers. The independence of Buss means a lot to all its readers. Since it is not a company-controlled publication, Buss can deal with the weaknesses, as well as with the strengths, of Heathkit® products. Furthermore, it can share news of compatible hardware and software from other vendors. You can be sure you won't hear about competitive products through the company-sponsored Heath User's Group. So why settle for a HUG when you can have a Buss?

- Information on new products is presented to Buss readers as it leaks out of Benton Harbor, not held back to suit the marketing plans of the manufacturer.
- Buss features candid accounts of owners' experiences with their computers and peripherals. This is far more valuable than a magazine article based on the opinions of a single reviewer.
- The discoveries of other Buss subscribers--often made the hard way--can help you plan additions to your system. Thus reading Buss may well save you enough money to pay for the subscription several times over.

The information in Buss travels by first class mail (by airmail outside North America). Your subscription can be on its way to you within a week. You have the choice of starting either with the latest issue or with available back issues. Buss is a proven publication that keeps getting better. So send for it.

\$7.49 for 12 issues (U.S. funds only. Outside North)
\$10.95 for 18 issues (America: \$9.49/12; \$13.95/18) ✓ F4
Buss **The Independent Newsletter of**
325-K Pennsylvania Ave., S.E. **Heath Co. Computers**
Washington, DC 20003

NORTH STAR

DISK ASSEMBLER and DISK EDITOR

Both programs read and write disk files; file size not limited by memory. Assembler will assemble up to ten source files at a time; permits modular programming with programs easily relocated by reassembling at the desired address. Editor does not use line numbers; it searches for strings. Lines may be inserted, deleted and displayed. Large disk source files allow programs to be fully commented.

**ASSEMBLER/EDITOR on disk
with users manual...\$30**

COMPUTER SYSTEMS DESIGN

906 N. Main

Wichita, KS 67214

DEALERS INQUIRIES INVITED

TRS-80

QUADRUPLE YOUR TRS-80 MEMORY!

In just a few minutes with no soldering you can conveniently convert your TRS-80 memory from 4K to 16K Bytes. The conversion kit includes eight high quality, fast 250nS dynamic RAM chips, two pre-programmed dip shunts and easy to follow instructions. This simple memory expansion kit can turn your TRS-80 from a minimum memory size machine to a powerful 16K (or 32K) computer with room for the kind of programs you have always wanted to write and use. Save over \$100.00 from the manufacturer's price. Can also be used for Expansion Unit empty sockets.

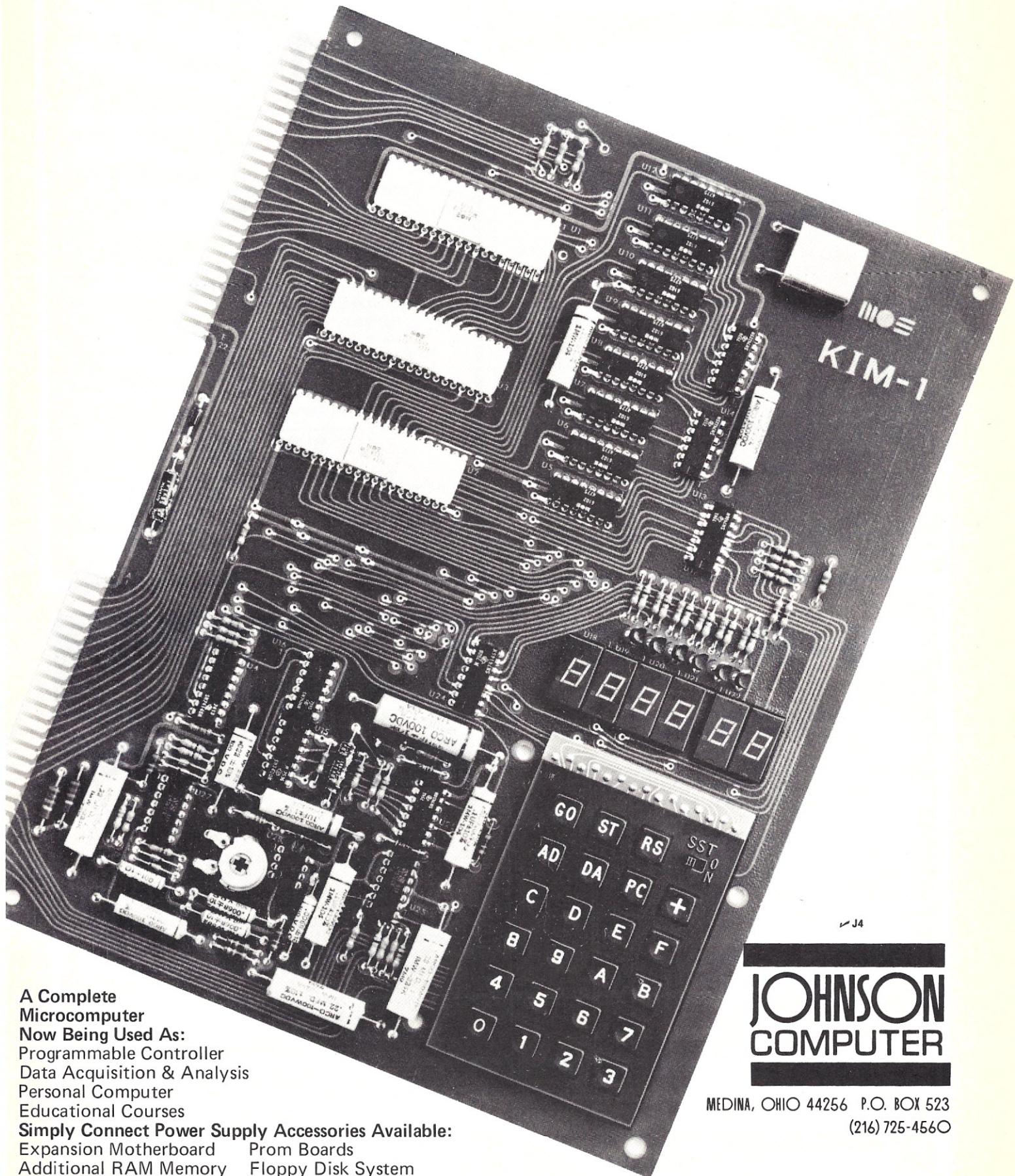
No. TRS-1 RAM Package — \$125.00

SUPPLIES LIMITED — ACT NOW!!

R.S.H. ELECTRONICS ✓ R26
2383 Arapaho
Thousand Oaks, CA 92360

KIM-1

175.00



A Complete
Microcomputer
Now Being Used As:
Programmable Controller
Data Acquisition & Analysis
Personal Computer
Educational Courses

Simply Connect Power Supply Accessories Available:
Expansion Motherboard Prom Boards
Additional RAM Memory Floppy Disk System

**JOHNSON
COMPUTER**

MEDINA, OHIO 44256 P.O. BOX 523
(216) 725-4560

**NOW A SOLUTION
TO YOUR I/O HEADACHE #33**



The OE 1000 Terminal is a low cost stand alone video terminal that operates quietly and maintenance free. It will allow you to display on a monitor or modified T.V. 16 lines of 64 characters. The characters can be any of the 96 ASCII alphanumerics, and any of the 32 special characters. In addition to upper-lower case capability it has a scroll up feature and full X-Y cursor control. All that is required from your microcomputer is 300 baud, RS 232 or 20 mA current loop, serial data. And if that is not enough the price is only \$275.00 in kit or \$350.00 assembled, plus \$5.00 shipping and handling. To order phone or write:

OTTO ELECTRONICS ✓09
P.O. Box 3066
Princeton, N.J. 08540
609/448-9165

MC, BAC, COD accepted N.J. residents add 5% sales tax.
Dealer inquiries invited.

TRS - 80 OWNERS

When you get tired of backgammon and space trek you'll want to put your computer to more serious uses. Perhaps we can help.

Our business is the generation of well-written, well-documented scientific software. Our first offering is a reliable, accurate general purpose matrix inversion program which can be used as a stand alone mainline or can be folded into your own program (source languages are level I and level II basic). The level I routine is tightly packed and both allow the inverse to be built up over the original matrix to conserve memory if you desire. A 10x10 runs about 45 sec. A 16K machine can handle a 60x60 array. The distribution medium is cassette. The price is \$9.95 prepaid with order. (N.Y. residents add 7% sales tax.)

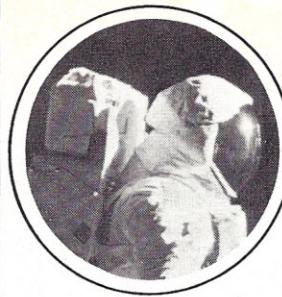
Other programs are now in preparation. Watch our ads or drop us a line if you have a specific requirement.

SIGNIFICANT SOFTWARE

Box 9274

ROCHESTER, N.Y. 14625

✓S73



**SPACE AGE
COMPUTER STORE**

NEW YORK CITY
and
LONG ISLAND

IF YOU WANT PROFESSIONAL SERVICE
IN A CASUAL ATMOSPHERE...
AND A LARGE VARIETY OF EQUIPMENT

● **BUSINESS APPLICATIONS**

General Ledger, Inventory, Accounts Payable, Accounts Receivable, Word Processing Systems.

● **GENERAL APPLICATIONS**

Northstar Macro Assembler \$65
Northstar Mailing Label Program \$45

● **STOCK MARKET PACKAGE** (Unique) Makes
Makes Ticker-Tape Obsolete.

Send \$2.00 for descriptive brochure on Stock
Market Package.

BYTE SHOP ✓B14

THE AFFORDABLE COMPUTER STORE T.M.

130 East 40th Street New York, NY 10016 (212) 889-4204 (Corner Lexington Avenue)	2721 Hempstead Turnpike Levittown, NY 11756 (516) 731-8116 (Just East of Wantagh Pkwy)
Tues. thru Fri. 11 to 7 12 to 8	Saturday 10 to 5 10 to 5

Sold on Sol?



**Talk to The
Microcomputer
People.** A Sol computer system can be a big help to any small business. In more ways than one.

Sol is versatile. It can do your ledger. Solve engineering problems. Help you keep up with paperwork. Sol can even entertain you. Sol will do most of the things you can do with a minicomputer, for one quarter the cost. And it can grow with your ability to use it.

Sol is dependable. Each one comes with a full year's warranty. And when you do need service, just call us. We don't sell what we can't keep running!

If you, along with hundreds of others, are sold on Sol, there's only one thing left to do. Talk to The Microcomputer People® at Computer Mart of New Jersey and Computer Mart of Pennsylvania. Write or call us today.

Sol is brought to you from Processor Technology by The Microcomputer People.®

Processor Technology



Computer Mart of New Jersey

501 Route 27, Iselin, NJ 08830 • 201-283-0600

Tue.-Sat. 10:00-6:00 • Tue. & Thur. til 9:00

Computer Mart of Pennsylvania

550 Dekalb Pike, King of Prussia, PA 19406 • 215-265-2580

Tue.-Thur. 11:00-9:00 • Fri. & Sat. 10:00-6:00

✓C30

WELCOME TO THE SOURCE

A Z80/8080 DISK BASED DISASSEMBLER

Example: **THE SOURCE** produces the disk source file below from the following object code:

```
21 80 00 06 0A 7E CD 0F 01 23 10 F9 C3 00 00 F5
1F 1F 1F CD 1F 01 F1 CD 1F 01 3E 20 18 04 E6
0F C6 30 C5 E5 5F 0E 02 CD 05 00 E1 C1 C9
```

```
ORG 0100H
LBL000 EQU 0000H
LBL001 EQU 0002H
LBL002 EQU 0005H
LBL003 EQU 000AH
LBL004 EQU 000FH
LBL005 EQU 0020H
LBL006 EQU 0030H
LBL007 EQU 0080H
LXI H+LBL007
MVI B+LBL003
LBL008: MOV A,M
CALL LBL009
INX H
DINZ LBL008
JMP LBL000
LBL009: PUSH PSW
RAR
RAR
RAR
RAR
CALL LBL010
POP PSW
CALL LBL010
MVI A+LBL005
JMPR LBL011
LBL010: ANI LBL004
ADI LBL006
LBL011: PUSH B
PUSH H
MOV E,A
MVI C+LBL001
CALL LBL002
POP H
POP B
RET
LBL012: END
```

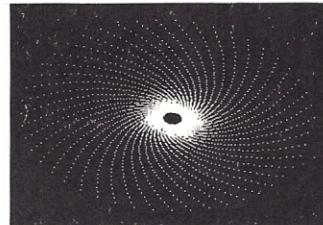
MJB COMPUTER ASSOCIATES ✓M65
41 Meadow Dr.
Spencerport, New York 14459

THE SOURCE is \$69.95 postpaid.
N.Y. residents add 7% sales tax.

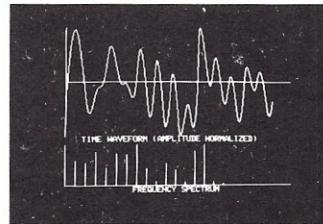
DEALER INQUIRIES INVITED

OUR VISIBLE MEMORY ADDS FUNCTION AND FUN TO YOUR 6502

This DOT MATRIX display board doubles as an 8K MEMORY. You can use it as a display, memory expansion or both with graphic and text display software available. You get resolution graphics with no wait states, no slow, and no processor overhead. K-1008 ASSEMBLED and TESTED \$240.00, BARE BOARD \$40.00 K-1008-1 GRAPHIC/TEXT UTILITY SOFTWARE LISTING \$20.00.



As a dot matrix formatted 200 high by 320 wide, it allows high resolution patterns to be displayed and evaluated. It enhances system performance for data acquisition displays, math equation plotting, etc.



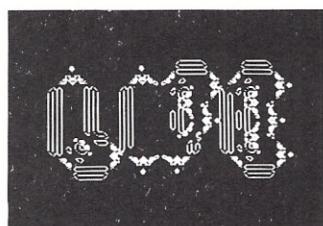
For charts and graphs, it is valuable in the educational, research and business fields. Shown to the right is a single period of a complex frequency waveform and its frequency spectrum chart.

MICRO TECHNOLOGY UNLIMITED VISIBLE MEMORY FOR THE KIM-1 MICROCOMPUTER

You have just witnessed the high resolution graphic capabilities of the MTU Visible Memory. But, it also offers other unique features. The dot matrix dot display subroutine displays 10 lines of 53 upper and lower case characters with true descenders. Another program allows the use of subscripts and superscripts. Subscripts and superscripts can also be displayed for equations.

- # 320 wide by 200 high graphic resolution
- # 8K bytes on-board memory comes exactly like 4 memory boards for the KIM-1
- # Graphics and text display software available
- # Ask Dave or Hal for an 8 page brochure on the MTU
- # Regular price \$209. Ask about our show special!

For text display, dot matrix is the ultimate. Any character set the user desires is possible. Even subscript and superscript in the same column, and—mixed text and graphics. The improved man-machine interface for an unskilled operator increases productivity.



Graphics allows you to program games with much more accurate representation of your game because YOU DETERMINE THE SHAPES on the display, not a ROM character generator. Our LIFE program allows tremendous creativity in creating complex colonies for observation of generation growth and decay.

Developed by a leading group of New England engineers for interface with the three 6502 KIM BUS systems (KIM, VIM, AIM). The K-1008 requires only the processor card and its power supply to function as a memory. Add a monitor and you have graphics and text display available. Micro Technology also makes K-1000 Power Supplies, K-1005 Card Files, K-1002 8 Bit Music Systems (with advanced software), K-1024 Regulated Wire Wrap card, K-1012 I/O/COMM/PROM/2708 Programmer card, K-1016 16K Memory, all sold assembled and tested or as bare boards. Write for technical information, prices and terms.

Overseas orders—include \$3.00 for shipping.

Micro Technology Unlimited ✓M44
P.O. Box 4596 Manchester NH 03108

electronic calculators		
LIST	HAM NET	TEXAS INSTRUMENTS ELECTRONIC CALCULATORS
\$299.95	\$269.95	T.I.-59, 960 STEP PROGRAMMABLE SCIENTIFIC
124.95	112.45	T.I.-58, 480 STEP PROGRAMMABLE SCIENTIFIC
59.95	53.95	T.I.-57, 154 STEP PROGRAMMABLE SCIENTIFIC
49.95	44.95	T.I.-55, 32 STEP PROGRAMMABLE SCIENTIFIC
59.95	53.95	T.I. PROGRAMMER, CONVERTS DECIMAL/OCTAL/HEX
69.95	52.95	T.I. MBA, SUPER PROGRAMMED FINANCIAL
LIST	HEWLETT-PACKARD ELECTRONIC CALCULATORS	
\$750.00	\$675.00	H.P.-97, 224 STEP PROG SCIENTIFIC PRINT/VISUAL
450.00	405.00	H.P.-67, 224 STEP PROG SCIENTIFIC
275.00	247.50	H.P.-19C, 98 STEP PROG SCIENTIFIC PRINT/VISUAL
175.00	157.50	H.P.-29C, 98 STEP PROG SCIENTIFIC
175.00	157.50	H.P.-10 BASIC HAND HELD PRINTER/VISUAL
325.00	292.50	H.P.-91, PREPROGRAMMED SCIENTIFIC PRINT/VISUAL
100.00	90.00	H.P.-33E, 49 STEP PROG SCIENTIFIC
80.00	72.00	H.P.-32E, PREPROGRAMMED SCIENTIFIC WITH STAT
60.00	54.00	H.P.-31E, PREPROGRAMMED SCIENTIFIC
495.00	445.50	H.P.-92, PREPROGRAMMED FINANCIAL PRINT/VISUAL
120.00	108.00	H.P.-38E STEP PROGRAMMABLE SUPER FINANCIAL
75.00	67.50	H.P.-37E, PREPROGRAMMED FINANCIAL
WE STOCK ALL HEWLETT-PACKARD CALCULATOR SOFTWARE AND ACCESSORIES		

SEND ME THE CALCULATOR(S) INDICATED BELOW, COMPLETE WITH INCLUDED ACCESSORIES, INSTRUCTIONS, AND MANUFACTURERS WARRANTY. I UNDERSTAND THAT IF I AM NOT COMPLETELY SATISFIED, I MAY RETURN IT WITHIN 10 DAYS FOR A COMPLETE REFUND (LESS SHIPPING).

MODEL(S) _____ QUANTITY _____ AMOUNT ENCLOSED \$ _____

WE HONOR _____ VISA _____ MASTERCHARGE _____ MONEY ORDERS _____ COD

ADD \$2.00 FOR POSTAGE AND HANDLING. PLEASE ALLOW 10 DAYS FROM DATE OF RECEIPT OF ORDER FOR DELIVERY. TEXAS RESIDENTS ADD 5% SALES TAX.

CARD NUMBER _____ EXPIRATION DATE _____

FULL NAME _____ CALL _____

STREET _____ CITY _____ STATE _____ ZIP _____

MORE LITERATURE MODEL(S) _____

*****DEALER INQUIRIES INVITED*****

Hartwells ✓H26
Office World, Inc.

MAIL TO: 6810 LARKWOOD
HOUSTON, TEX 77074
ATTN: STEVE, WA5OEN
PHONE: A.C. (713) 777-2673

Radio Shack Computer Users

TRS-80 monthly newsletter

The largest publication devoted to the TRS-80 System

- Business
- Personal Finance
- Practical Applications
- Gambling—Games
- Latest RADIO SHACK Developments
- Software Exchange
- Market Place
- Questions and Answers
- Program Printouts

• . . . and more

Major programs published monthly . . . Complete income tax program (long and short forms) . . . Inventory control . . . Extensive mailing list and file program . . . Payroll . . . Stock selection and indicators . . . Horse selector for picking winners . . . Renumber program lines . . . Chess . . . Checkers . . . Financial package . . .

\$24. Per Year

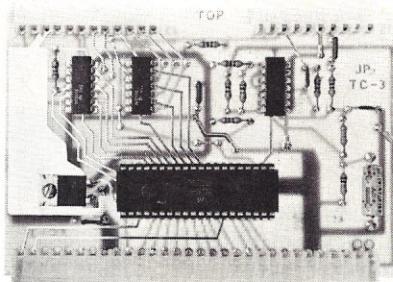


MATHEMATICAL APPLICATIONS SERVICE

Box 149K New City, New York 10956 (914) 425-1535

Send for FREE Software Catalogue (Including listings of hundreds of TRS programs available on cassette and diskette).

High Performance Cassette Interface



For SWTPC Computers

- **FAST** - 4800 Baud Loads 4K in 8 Seconds!
- **RELIABLE** - Error Rate Less Than 1×10^{-6} BYTES.
- **CONVENIENT** - Plugs Directly Into The SWTPC Motherboard.
- **LOW COST** - \$49.95 For Complete Kit.
- **PLUS** - A Fully Buffered 8 Bit Output Port Is Also Provided.

In Addition To Reading And Writing In High Speed Binary, The TC-3 Is Capable Of Reading Or Writing Cassettes In Kansas City Standard Format Without Any Modification to the Interface Board.

"Designed By Professionals For Outstanding Performance"

JPC PRODUCTS CO. J12
P.O. BOX 5615
ALBUQUERQUE, N.M. 87185

Terms: Cash, MC or Visa
Shipped Prepaid
NM Residents Add
4% Tax.

ATTENTION TRS-80 & APPLE USERS

A PRINTER FOR YOUR COMPUTER



\$995.00

MODEL 3S-80 for TRS-80

Ready to plug into your expansion interface.

- Ready to plug into your computer

MODEL 3S-PP

for computers with 8 bit serial port.

- Very high quality print

MODEL 3S-SS

for computers with RS-232 port.

- Completely refurbished IBM 731 I/O Selectric terminal in a new table

\$1095.00

for MODEL 3S-AA

Includes RS-232 card for Apple II. Specify model number on order.

- Upper & lower case removable type ball

- Special I/O interface

- Heavy duty re-mfg. IBM power supply

TERMS: VISA, MASTERCHARGE, Cashier Check or Money Order. C.O.D. with 10% down.

Shipping Via Air or Truck collect.

3 S SALES ✓^{S55}

P.O. BOX 45944
TULSA, OK 74145
918/622-1058

Western I/O presents a fully-intelligent IBM Selectric Terminal for only \$1,250!

That's right. An expertly-refurbished, heavy-duty, IBM 2970 I/O complete with everything you need for attachment to your home or small business computer. The only Selectric of its kind with complete terminal features and the only one anyone can offer you at this price!

Look what you get:

- Full RS-232C serial ASCII interface.
- MC6800 processor-based terminal w/1K static RAM (additional 1K optional).
- Full terminal controls including escape, control, rubout (delete), break and repeat.
- Selectable baud rates of 9600, 4800, 2400, 1200, 300, and 110.



Name _____
Address _____
City _____ State _____ ZIP _____

Send me: Communications terminal w/ _____ baudrate, \$1,250.
 Extra 1K RAM, \$50. Printer terminal, \$900. Master Charge
 Visa# _____ Exp. Date _____

Send check, money order or Visa/Master Charge number. No CODs. Personal checks require 3-4 weeks clearance. UPS, PP or common carrier shipped collect. Send inquiries to: Western I/O, 8337 E. San Miguel, Scottsdale, AZ 85253 (602) 947-0070. (Arizona residents add 5%).



Clip and mail coupon today!

- Built-in diagnostics.
- Total integration within the standard typewriter housing.
- 15" typewriter platen fully converted to use 10-pitch correspondence elements.
- Full 90-day warranty on controller electronics, 30-days on total machine.
- Complete factory testing before shipment.
- Controller kit availability (write for information).
- Printer-only model availability w/parallel ASCII interface.

✓W21

W I / O
WESTERN

Tired of trying to figure out how to make North Star BASIC do what you want?

Waiting to see if you can learn to program before buying a computer?

Need someone to "translate" the user's manuals for you?

Totally confused and frustrated?

The solution is . . .

The User's Guide to North Star BASIC

The essential book for anyone working with North Star BASIC.

Ask for it at your local computer store. Dealers contact:

**INTERACTIVE
COMPUTERS**

**Interactive Computers
7620 Dashwood
Houston, Texas 77036
(713) 772-5257**

DAM YOUR COMPUTER

DATA
ACQUISITION MODULES by 

NOW YOUR COMPUTER CAN LISTEN TO THE REAL WORLD. YOU GET 16 8 BIT ANALOG INPUTS WITH OUR AIM16.

MEASURE - RECORD - CONTROL

- TEMPERATURE
- DIRECTION
- PRESSURE
- LIGHT LEVELS
- db
- POLLUTION CONTROLS
- DARKROOMS
- HUMIDITY
- LIGHT
- JOYSTICKS
- ENERGY CONSERVATION EQUIPMENT
- GREENHOUSES
- SPEED
- WEATHER STATIONS
- NOISE POLLUTION
- pH
- EARTHQUAKE TREMORS
- VELOCITY
- ACCELERATION
- GAMES

AIM161 STARTER SET

1 - AIM161	16 ANALOG INPUTS 8 BITS - 100 MICROSEC
1 - POW1	POWER MODULE
1 - ICON	INPUT CONNECTOR - 20 PINS SOLDER EYELETS
1 - OCON	OUTPUT CONNECTOR - 18 PINS SOLDER EYELETS

\$189.00



CONNECTICUT microCOMPUTER

150 POCONO ROAD - BROOKFIELD, CONNECTICUT 06804 ✓ C107

(203) 775-9659



Trans-Data Corporation

✓ T47

APPLE OWNERS

NEW SOFTWARE AVAILABLE

APA09 Label Print	\$10.00
ADI06 Mailing List System	\$50.00
ADI02 File Use Tutorial	\$15.00
APA04 Finances	\$15.00
APA07 Check Book	\$20.00
AEI05 Super Math	\$18.00
AEI08 Metrics Conversion	\$20.00
AEI06 Memory Aide	\$18.00
AGI16 Horse Race	\$18.00
AGI03 Keyboard Organ	\$18.00

ORDERING INFORMATION . . .

Floppy Disk add \$8.00. Add \$2.00 for shipping & handling. Florida residents add 4% tax. Send check, money order or credit card to Rey International Inc., Dept. K118, 161 Almeria Ave., Coral Cables, FL 33134 Tel. (305) 576-7666.

161 Almeria Ave., Coral Gables, FL 33134 • Phone (305) 576-7666

EXPAND Your PET & TRS-80 CAPABILITIES!

HARD COPY Interface

- RS-232 OR 20MA. CURRENT LOOP
- HALF DUPLEX
- USE ANY SERIAL PRINTER, TELETYPE, CENTRONICS, DECRITER,
- VARIABLE BAUD RATE, 110,300,1200 BAUD (PLEASE SPECIFY)
- 40-80-120 CHARACTERS PER LINE (PLEASE SPECIFY)
- SOFTWARE INCLUDED, ASSEMBLED AND TESTED
- VFET BUFFER DRIVES LONG CABLES

PRICE \$59.95



✓ G24

Look for our...

- S-100 TO TRS-80 EXPANSION MOTHERBOARD!
- PET EPROM FIRMWARE MONITOR I/O EXPANSION INTERFACE!

EPROM Programmer

- PROGRAM 2708 OR 2716 EPROMS SINGLE AND MULTI-SUPPLY DEVICES (FACTORY SPEC.)
- USES TEXT TOOL ZERO INSERTION FORCE SOCKET
- ASSEMBLED AND TESTED, QUALITY COMPONENTS ONLY
- PROGRAM BASIC, DOS, FILING, HAVE THOSE VALUABLE PROGRAMS IN FIRMWARE. DON'T WASTE TIME LOADING AND UNLOADING TAPES AND DISKS

PRICE \$179.95

G.P.A. ELECTRONICS
906 BLAIR AVE.
OAKLAND CA. 94611
(415) 654-3898



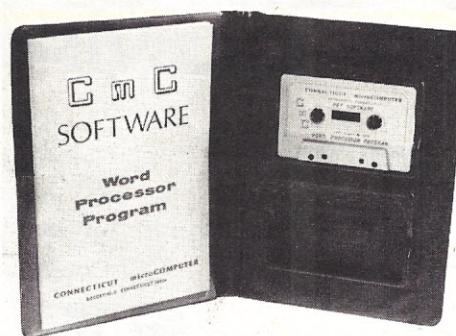
NEW PRODUCTS

(from page 16)

multiple space compression and tape I/O are used for efficient file storage. U-draw (\$17.95) is a high-resolution programmable graphics editor with tape I/O for storing finished drawings. It can be used for interior design and computer art. Documentation includes instructions for linking figures to user programs.

The Electric Crayon (\$17.95) is a graphics editor similar to U-draw but in brilliant low-resolution color. The Music Box (\$12.95) gives three-octave sound with no additional hardware. Type in the song and the Music Box will play it for you. Notation includes sharps, flats, note time, rests, dotted notes and tempo. It is easily retuned for special effects. The Number Cruncher (\$9.95) is a set of single precision math and ASCII-to-hex subroutines.

MUSE software also includes games (\$12.95 each): Tank War, Maze, Side Shows and Escape. Guaranteed loading on all tapes.



The CmC Word Processor for the PET.

The MUSE Co., 7112 Darlington Drive, Baltimore MD 21234.

Computer Covers

Extend the life of your computer equipment with one of a new line of protective dust covers from Cover Craft. By keeping components clean and dust free, dust covers can protect your system and reduce maintenance.

Cover Craft covers are designed to fit all popular brands of computers and peripherals.

Hundreds of sizes are available, each designed to precisely fit a specific model.

Each cover is custom designed, then hand cut from textured flexible vinyl. All seams and edges are machine stitched for maximum strength.

Dust covers for popular models manufactured within the last two years will shortly be available at retailers across the country. Older or less popular models may be ordered directly from the factory.

Cover Craft, PO Box 555, Amherst NH 03031.

PET Word Processor

Word processing has come to

Cover Craft dust covers.

the microcomputer with this \$29.50 program for the PET. It's from Connecticut microComputer (CmC) and is designed to work with their printer interface unit ADA 1200C, which sells for \$169 complete. You supply the printer.

The word processor allows you to type and edit letters or other forms. It's not much more difficult to learn to use than most of the higher-priced spreadsheets, but it will probably take you a day or two to get used to all of the special coding methods. You have to learn to use any word processor and become familiar with the commands and directives that make it work. In the case of the CmC processor you'll have to get

Julius Caesar tried, Genghis Khan tried, Napoleon tried too . . . now, It's your turn.

We can't guarantee that you'll control the world with a **Mullen Controller Board** kit; but this S-100 peripheral can control disco lights, automatic cat feeders, time lapse photography experiments, environmental heating systems, and a whole lot more. 8 opto-isolator inputs respond to external stimuli . . . your computer decisions based on this information . . . and interfaces to the outside world through 8 on-board computer controlled switches, suitable for driving low power loads or triggering Mullen 500 Watt power modules.

Interested? We thought you would be. So, we've prepared an information packet available at finer computer stores across the nation . . . or, circle the reader information number.

Just what the world needs: products to make your computer useful.

MULLEN Computer Products
BOX 6214, HAYWARD, CA 94545

✓ M32

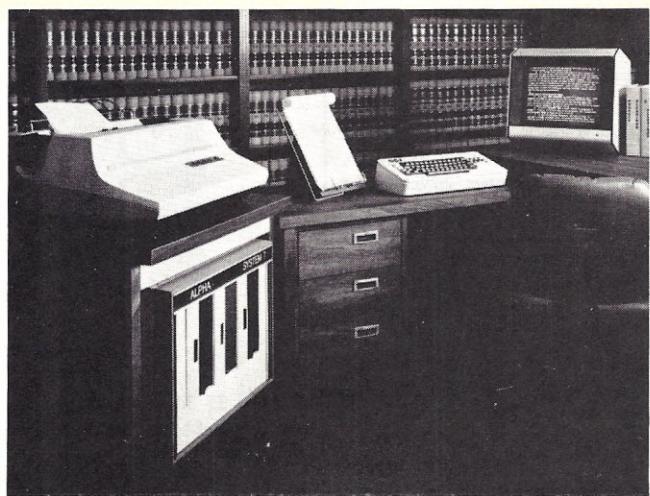
used to about 25 special codes that move the pointer around, allow editing, set line lengths, line spacing, indents, etc.

For your \$29.50 you get the program on a cassette plus a 25-page instruction booklet. The instructions are reasonably clear so, with a bit of practice, you'll be typing letters with your PET in short order.

Of course, the drawback to all of this is the cost of the printer. If you want to end up with first-rate copy you are talking about an IBM Selectric typewriter . . . and that costs more than the PET and interface. You might rationalize the expense on the basis that nothing short of that is going to satisfy you, no matter what computer you get, so what the heck?

The less expensive matrix printers produce readable copy, but not attractive copy. The Diablo and Qume printers provide beautiful copy, but cost about double the Selectric. If you don't mind ending up with all capital letters, you can get a \$50 Teletype printer and use that! You end up with typical crummy Teletype copy . . . but at least it's inexpensive.

Connecticut microComputer, 150 Pocono Road, Brookfield CT 06804.



Alpha System 7 law office computer.

For Lawyers Only

The Alpha System 7 is a word processor designed specifically for law office use, incorporating a full-fledged Z-80 microcomputer system with 56K of static RAM. The system allows automatic search and replacement of any variable such as client name, dates, locations and amounts. Once a document is entered, it need never be entered again as

only the variables are changed. For example, a 25-page pleading can be changed, as to any name, date, sum or any other variable that occurs, in less than two seconds! Pages, paragraphs, lines, words or characters can be inserted, deleted or changed with the system automatically opening or closing text to accommodate the inserted, deleted or moved text. The results are instantly visible on the screen.

The legal time and cost system

is designed to accommodate from one to 20 or more attorneys. All accounts receivable and trust account ledgers are stored, and statements may be viewed or printed at any time. Numerous management reports, including aged reports by matter, client, attorney and other variables, are available. Trust accounts are handled in a similar fashion.

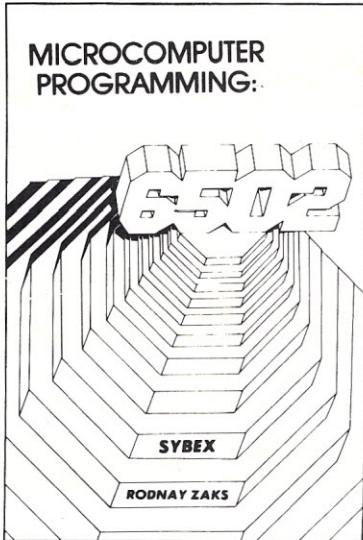
The attorney calendar system can display and print calendars by client, attorney, secretary, case number, time or date. Entries may be made for deadlines years in the future.

The word processing system utilizes a high resolution 22 MHz 15 inch video display and a high-speed 45 cps daisy wheel letter quality printer. Margins, justification, pitch, centering, boldface type, line spacing, headings, underlining and automatic page numbering are under program control and may change dynamically during printout by inserting appropriate commands within the text.

Storage medium is dual 8-inch flexible IBM 3740 format disks with a capacity of well over 100 pages of text per disk. (Third disk drive is available at extra cost.)

Additional programs, such as financial, investment and pay-

LEARN TO PROGRAM WITH THE 6502



TO ORDER

- **BY PHONE:** call (415)848-8233
BankAmericard/Mastercharge accepted
- **SHIPPING:** no charge when payment included.
- **ADD:** \$1.50/book for fast shipping.
- **TAX:** in California, add sales tax.
- **OVERSEAS:**
SYBEX-EUROPE, 313 rue Lecourbe,
75015 - PARIS, France Tel:(1)8282502



2020 Milvia St.
Berkeley,
Calif 94704 ✓ S42
(Dept K)

● MICROCOMPUTER PROGRAMMING:6502

By Rodnay Zaks, ref C202

\$9.95

This text will teach you how to program with the 6502, from ground zero if necessary: arithmetic, input-output, including polling and interrupts, addressing techniques. Completely self-contained, it can be used by the novice to learn programming or by anyone who wants to learn about basic techniques, using the 6502.

(The author has taught programming to more than 1000 persons).

● 6502 APPLICATIONS BOOK

(For SYM and KIM), ref D302

\$12.95

A series of practical (hardware and software) applications for a 6502 board (SYM preferred or KIM) which can be used as experiments, or implemented at minimal cost. Examples are: morse generator, electronic piano, digital clock, home alarm system, traffic controller.

● WITH SYM-MICROCOMPUTER BOARD (COMPLETE SELF-STUDY)

C202 + D302 + SYM Board + cassette \$330
(shipping add'l)

NAME _____	POSITION _____
COMPANY _____	
ADDRESS _____	
CITY _____	STATE/ZIP _____
<input type="checkbox"/> C201 <input type="checkbox"/> C207 <input type="checkbox"/> C200 <input type="checkbox"/> C202 <input type="checkbox"/> D302 Other _____ <input type="checkbox"/> Payment enclosed <input type="checkbox"/> C.O.D. <input type="checkbox"/> ADD \$1.50/BOOK FOR FAST SHIPPING <input type="checkbox"/> charge my <input type="checkbox"/> Visa <input type="checkbox"/> Master charge <input type="checkbox"/> American Express <input type="checkbox"/> Number _____ Exp date _____ Signature _____ <input type="checkbox"/> Send catalog. <input type="checkbox"/> FREE CATALOG/ ORDER FORM <input type="checkbox"/>	



roll, are available. Furthermore, since this is a complete computer system, custom programs may be written for nearly any purpose. Available languages include BASIC Interpreter, BASIC Compiler, FORTRAN 80, COBOL and PASCAL.

A users group has formed and its newsletter provides a catalog of available pleadings, contracts, wills and trusts, correspondence and other documents on disk ready for immediate entry into memory. Only a nominal copying and mailing charge applies. Lease/purchase prices are as low as \$300 per month.

Alpha Professional Systems, Inc., 9465 Wilshire Blvd., Suite 518, Beverly Hills CA.



MicroWorld's guide.

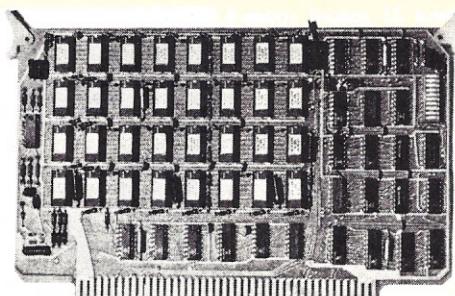
The MicroShopper

The new fall 1978 *MicroShopper*, the recognized leading buyer's guide in the field of microcomputers, is now available. The *MicroShopper* serves as an invaluable aid to match the applications software to hardware for a complete business system.

The world of microcomputers—from inexpensive home games to versatile multi-user systems—is presented in easy-to-understand terminology. Text is written clearly enough for beginners to understand but contains enough information to satisfy professionals in the microcomputing field.

The *MicroShopper* features an introductory text on microcomputing and a section on how to select a microcomputer system for business applications. Also included is a glossary of computer buzzwords, graphic visualizations on how microcomputers work and how and where they can be used most effectively.

Printed in a large 11 x 14 inch format, the *MicroShopper* includes over 125 photographs of equipment from more than 120 manufacturers with over 500 products discussed in detail.



CI-6800 memory board.

Enclose \$5 in check or money order (includes postage and handling).

MicroWorld, 1425 W. 12th Place, Tempe AZ 85281.

RAM Board for Exorcisor I or II

CI-6800 16K x 8 semiconductor memory system is designed specifically for operation with Motorola Exorcisor, Motorola Exorcisor II and MEC 6800 evaluation modules. The new memory board features easy expansion of 32K, 48K or 64K by simply interchanging the 4027, 4K x 1 dynamic memory chip with its 16K equivalent with no further modification to the

board. The CI-6800 memory board plugs directly into existing Exorcisor connectors.

The CI-6800 allows maximum processor throughput with the use of hidden refresh control logic on-board. Data access time is 300 nsec and cycle time is 750 nsec. On-board memory select is available in 4K increments up to 64K words of memory. Write disable switch on-board makes the RAM a ROM to the outside world.

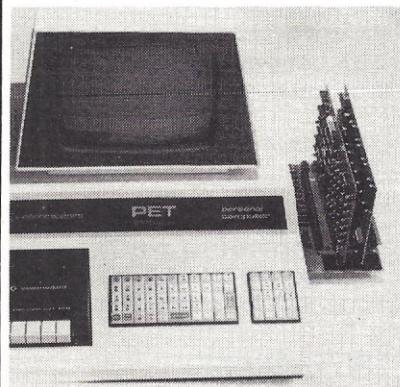
Complete board power consumption is under 5 Watts. Size is 5.75 x 9.75 inches. Price is \$390 for 16K x 8 and \$995 for 64K x 8.

Chrislin Industries, Inc., 31312 Via Colinas #102, Westlake Village CA 91361.

From the people who brought you KIMSI —
Mr. Interface™ does it again with...

BETSI

The PET* to S-100 bus
Interface/Motherboard



Expand your PET as easily as S-100 users !

- Plugs directly into any PET, no cable fabrication or additional connectors required.
- Compatible with virtually all S-100 boards (including memory and I/O types).
- Does not slow the CPU or alter PET's operation in any way.
- Does not interfere with PET's IEEE or parallel user ports.
- Interface draws only 100ma at 8V.

And Betsi includes:

- On-board Dynamic Memory Controller for the S.D. Sales "Expando-ram" high density/low power memory board (expand PET's memory to the limit on a single S-100 card)!
- On-board sockets and decoding circuitry for 8K of PROM (add future PET firmware without purchasing an S-100 PROM card).

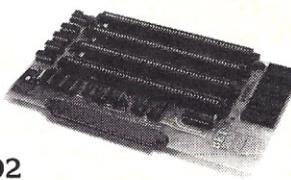
Now available from stock at a price that can't be beat (even just for memory expansion)!

BETSI Interface/Motherboard — Kit \$119, Assembled \$165

Expandoram 24K memory board — Kit \$364, Assembled \$414

See your local dealer or contact: **FORETHOUGHT PRODUCTS**

87070 Dukhobar Rd. #H, Eugene, OR 97402
(503) 485-8575



* PET is a Commodore product

F8

Send us \$2.

We'll send you the latest microcomputer catalogue from Computer Enterprises:

Computerlogue '78



Special! With your new Computerlogue '78 we'll also send you a credit coupon worth \$3 on your first order of \$20 or more.

computer enterprises™ ✓C33

P.O. Box 71
Fayetteville, N.Y. 13066
(315) 637-6208

P.E.T. Food

NOURISH YOUR HUNGRY P.E.T. WITH SELECTIONS FROM CREATIVE SOFTWARE'S EXTENSIVE MENU!

DUAL JOYSTICK INTERFACE: This Creative Software interface allows you to plug in two Atari™ joysticks (not included) with no modifications to the P.E.T. Comes with two games and complete programming instructions \$45.00

JOYSTICKS: for above interface, price each \$12.50

BREAKOUT: NEW — Written in machine language for increased speed and enjoyment. Uses either keyboard input or any CREATIVE SOFTWARE joystick (single or dual). You get ten balls to knock out three double layers of bricks. Positively addicting \$10.00

LIFE: (By S. Bartonsmith) Possibly the finest personal computer version of LIFE currently available, this program uses machine language routines to display up to four new generations per second. User-definable initial configuration, complete screen wraparound, and introducing two original additions—"posts" and "holes." . . . \$20.00

TRAP and CRAPS (Joystick or keyboard input) \$10.00

HURKLE and ONE-QUEEN (Joystick or keyboard input) . . . \$10.00

HOUSEHOLD FINANCE Parts I and II \$15.00

ORDERS: Send check, money order, or VISA/Mastercharge (include expiration date) and add the following shipping charges: 1-2 programs (or dual joystick interface)—1.50. 3-4 programs—2.00. 5 or more programs—2.50. Extra joysticks, each—1.50. California residents add 6% sales tax.

INFORMATION: More information on these and many other currently available programs are available on a free flyer. Write directly to Creative Software for a complete list.

Creative Software ✓C97

P.O. BOX 4030, MOUNTAIN VIEW, CA 94040

Reduce programming costs



DATA1-K RESIDENT ASSEMBLER/EDITOR FOR THE MOS TECHNOLOGY 6502

The DATA1-K resident assembler/editor is the new, efficient approach to the assembly of microcomputer programs. All assembler/editor functions are performed entirely within memory. In most cases there is no need for a special computer system! Program with the DATA1-K on the system which will ultimately make use of the object code. This not only lowers the initial cost of a development system but greatly decreases the amount of time spent on program debugging.

ALSO AVAILABLE IN CASSETTE

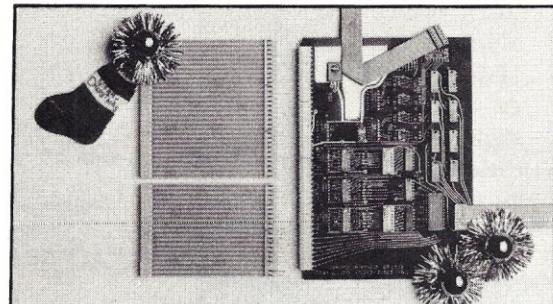
The DATA1-K assembles fast—over 600 lines per minute—and uses the standard MOS Technology Assembler Language. The DATA1-K features a truly general purpose line oriented text editor with error correction and paged output capability. The DATA1-K is currently in use by: General Electric, Western Electric, Eaton, Monitor Systems, the University of Cincinnati, and many others.

It is presently available on KIM-1 format paper tape or cassette and it includes one year warranty and update.

Price: \$250.00

Available from Johnson Computer, P.O. Box 523, Medina, OH 44256. Phone: (216) 725-4560. Terms: Payment with order/add \$2.00 shipping and handling/add \$10.00 for cassette version. Delivery: stock to 30 days.

JOHNSON COMPUTER P.O. BOX 523 MEDINA, OHIO 44256 ✓J4



6800 OWNERS

At last a real world **fully addressable** SS-50 control interface. Control robots, appliances, organs, solar devices, etc. Applications limited only by your imagination. Easy to use with machine language as well as basic. Fully buffered board plugs directly onto mother board and responds to any address defined by user. 8 fast relays latch data while 8 opto-isolators allow handshaking capacity.

Kit \$98.00

Assembled and tested \$125.00

EXTENDER BOARDS

Extend both the 30 and 50 pin buses in SWTP 6800.

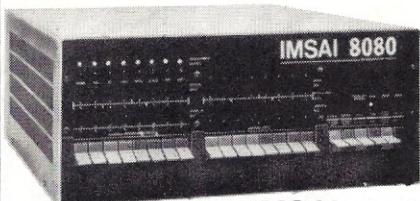
Both for \$19.95.

Visa & Master Charge • Ariz. Res. add 5% Sales Tax

WRITE FOR DETAILS

TRANSITION ENTERPRISES INC. ✓T46
Star Route, Box 241, Buckeye, AZ 85326

Bits Bytes Books, argains



IMSAI et al

MARKETLINE SYSTEMS, Inc.

2337 Philmont Ave. ✓ M17
Huntingdon Valley, Pa. 19006
215/947-6670 • 800/523-5355

Dr. Daley PRESENTS

the finest in
software for

PET

The current list
has over 60
different tapes.
Write for it or
ask your PET
dealer if he has
DR. DALEY'S
Software
425 Grove Ave.
Berrien Springs, MI
Ph. (616) 471-5514

Sun. to Thurs. noon to 9 PM eastern time

QUALITY SURPLUS

S100 CORE MEMORY: Ampex minicomputer memory new in original box, tested, guaranteed, full documentation, \$8150, 16K \$325. Proven simple S-100 interface design \$10 with order.

NOVA 1200 CORE: For Data General Nova 1200, 1210, 1220 and DCC 116. Used, tested, guaranteed, 4Kx16 DCC \$100, DGC \$125. Also limited quantity of non-working (not core pad) boards at \$60 each.

PORTABLE ASCII TERMINALS: Attach case, hard copy, normal TTY paper, w/acoustic coupler & RS232, Data Products "Portacom" \$515 to \$650 depending on options. Beautiful. Request brochure.

NEW TELETYPE: Add quality hard copy to your CRT based system, RO33s (3300-1AE) \$425. ASR33s (3320-4JC) paper tape punch, reader, etc. \$1100. Both types brand new in box, 20mA, w/stand.

POWER SUPPLIES: EM1 5V@14A, -16V@3A, +16V@1.5A new \$65. LAMBDA 5V@4A \$28, 5V@9A \$45, 5V@31A \$65. NORTH 5V@5A, 22V@7A new \$40. Most voltages very adjustable. Dozens of other types in stock, see our catalog, or call.

ASCII KEYBOARDS: Microswitch model 33 TTY equivalent new \$50. Same w/numerical pad, used \$50. Clare Pendar full 128 char upper & lower case \$75; see catalog for other interesting types.

MODEMS: Vernitron, 0-300 baud, w/acoustic coupler, in carrying case, HDX/FDX, built in 20 mA loop supply, motor control, line monitor speaker, 110 VAC, \$50.

DOCUMENTATION: We pride ourselves on good documentation. Most items come with full schematics, maintenance and "how-to-use" notes.

CATALOG: Our current catalog describes these items and many others in great detail. Write, call or circle the reader service number for a copy via first class mail.

TERMS: UPS included, except terminals, TTYs and heavy power supplies. COD add \$1. Master Charge add 4%. NJ add sales tax. Everything guaranteed. Immediate shipment or immediate refund.

ELECTRAVALUE INDUSTRIAL
P.O. BOX 157-K
MORRIS PLAINS, NJ 07950

Everything Guaranteed
Phone Orders &
Questions are Welcome
(201) 267-1117

Reader Service #E18

DISPLAY-SENSE BOARD

- For the S-100 Bus
- For hardware and software debugging
- Maintenance and programming aid
- Data, address and status LEDs
- Sense addressable to 256 locations
- Sockets for remote LEDs and sense
- Power saving modes — LEDs OFF or ON only in 'WAIT'
- Fully socketed and buffered-gold edge contacts
- Silk screened, solder masked glass epoxy PCB.

KIT \$74.95 thru Jan. 31, 1979 — Regular Price \$89.95
Deliveries Start in Dec. 1978 — Allow 2-3 Wks. for Shipping

"COMPUTER CANOPY" DUST COVERS

- Ideal for the home or office
- Attractive, heavy upholstery vinyl
- Protects against dust, dirt, spills
- Choice of textured Walnut or Tan

POSTPAID
IN U.S.A.
Delivery:
Stock to 3 Weeks

Covers for	APPLE II	\$14.95
PET, ADM-3, H-9		\$19.95

M/C, VISA, M.O., C.O.D.
Add \$2 Shipping for PC Board

TX residents add 5% tax
Add \$1 for C.O.D.



Digital Dynamics, Inc.
Department K
Post Office Box 27243 ✓ D37
(512) 231-2012

IEEE-488 INTERFACE FOR THE PET OR H.P. BUSS

OR FROM TTL PORT
DIRECT TO PLOTTER

ABCDEF



1234567890

- DIGITAL STEP RESOLUTION .015"
- ALPHA - NUMERIC SOFTWARE

KIT IS \$195,-

ASSEMBLED- TESTED \$ 249,

**X & Y
ENTERPRISES**
P. O. BOX 796
HUNTSVILLE, AL 35804

GRAPHICS
DEMOS

RADIO SHACK/TRS-80 16K MEMORY PACKAGE

This package includes all that is necessary for a very easy expansion of the memory 4K to 16K bytes. All you have to do simply is: take the 4K chips out and plug in new chips in the same sockets. No soldering! Simple, easy-to-follow instructions! User-tested. Kit contains eight 250nS Dynamic RAM Chips, 2 plug-in DIP Shunts and a complete set of instructions. Expansion Unit Owners can fill empty sockets with 16K or 32K RAM. It is easy! It is fun! It is a smart way to save money!

No. 786-R 16K RAM Package \$129.95
No. 786-Z 32K RAM Package \$238.50

DELTRONIKS ✓ D28

P. O. Box 29363
Atlanta Ga 30359

(404) 458-4690

MEMORY PRICE CUT!! 16K bytes \$85, for TRS-80, APPLE, EXIDY, S-100, 8K bytes \$56 for PET, S-100

16K MEMORY KIT \$85, 8 RAM chips (250ns. 4116), jumper DIPS and simple instructions (specify your computer)
8K MEMORY Kit for ExpandoPET or ExpandoRAM \$56, 8 RAM chips (250ns. MK4115)
S-100 SD SYSTEMS EXPANDORAM KIT \$143.00 32K version with 8K MEMORY Kit \$199.00, can be expanded up to 32K with 8K MEMORY Kits. 64K version with 16K MEMORY Kit \$292.00, can be expanded up to 64K with 16K MEMORY Kits.
DISKETTES: VERBATIM 5" TRS-80, APPLE, NORTHSTAR, etc. (specify) 3.60 ea.; Verbatim 8" \$3.90 ea.
DISK DRIVES: for TRS-80, Shugart SA400 complete with case and power supply \$399; SA400 drive only \$290; SA800R drive only \$495



— THE CPU SHOP —
Dept K 39 Pleasant St.
Charlestown MA 02129
(617)242-3350

Check/MC/Visa welcome.
Add freight charge of \$2.50 for all orders.
MA residents add 5% tax.

T I S

WORKBOOKS FOR THE COMMODORE PET 2001

Getting Started with Your PET WB-1 \$4.00
Covers the fundamentals of PET BASIC: calculator and program mode, data input and output, data representation, program storage on the cassette.

PET String and Array Handling WB-2 \$3.95
Covers string and substring search, concatenation, replacement and manipulation.

PET Graphics WB-3 \$4.95
Covers use of cursor control and special graphics symbols to draw plots, histograms, and sketches.

PET Cassette I/O WB-4 \$4.95
Covers OPEN, CLOSE, string and numeric data files.

Miscellaneous PET Features WB-5 \$3.95
Covers the clock, random number generator, upper and lowercase alphabetic characters, saving memory space, etc.



Don't be "liion" around!
Order NOW! Send check or
money order today!

TIS
P.O. Box 921
Los Alamos, N.M. 87544
T41 Money back guarantee.

: PET and TRS-80 :

Just LOAD and GO! Software
Pre-recorded Business Programs
USEFUL-PRACTICAL-LOW-COST!
NO PROGRAMMING EXPERIENCE REQUIRED!

NEW! NEW! NEW!

For the first time ever a GENERAL LEDGER program. You customize the card of accounts for the requirements of YOUR business.

Accounts are kept in 4 groups:

- A-DEPOSITS, taxable, to 10 accts.
- B-DEPOSITS, non-taxable, to 8 accts.
- C-WITHDRAWALS, expense items, to 40 accts.
- D-WITHDRAWALS, non-expense, to 8 accts.

Accounts can be "NAMED", if desired.

TRS-80TM programs adapt perfectly to disc.
\$21.95 plus \$1.50 shipping & handling

Programs include 2 PerCom "Pilon-30" record cassettes—money back guarantee

HUSTLER Series 1 for PET(tm) are now available in Britain and Europe through:

PETSOFT
PO Box 9, Newbury Berks. RG13 1PB, England

Specify which computer is used.

All mail orders must be pre-paid.

Dealer Inquiries Invited
COMPUTERS ONE ✓ C81
#306 Kahala Office Tower
4211 Waialae Ave.
Honolulu, HI 96816
(808)737-2933

● ATTENTION ● APPLE II OWNERS

Southeastern Software announces ready to run programs on tape for your computer . . .

Send \$5.95 plus 50¢ postage and handling for demo tape and sample newsletter designed for Apple II owners.

Demo tape includes 1 game and 2 general interest programs. Specify if you want tape to run in BASIC, Applesoft or Applesoft II.

SOUTHEASTERN SOFTWARE

7270 Culpepper Drive ✓S52
New Orleans, LA 70126

EPROM PROGRAMMER



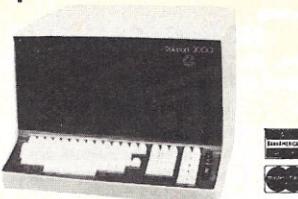
Software available for F-8, 6800, 8080, 8085, Z-80, 6502, KIM-1, 1802.

The EP-2A-79 will program the 2704, 2708, TMS 2708, 2758, 2716, TMS 2516, TMS 2716, TMS 2532, and 2732. PROM type is selected by a personality module which plugs into the front of the programmer. Power requirements are 115 VAC, 50/60 Hz at 15 watts. It is supplied with a 36-inch ribbon cable (14 pin plus) for connecting to microcomputer. Requires 1 1/2 I/O ports. **Assembled and tested \$145, Plus \$15-25 for each personality module. Specify software.**

OPTIMAL TECHNOLOGY, INC.

Blue Wood 127, Earlysville, Va. 22936
Phone 804-973-5482 ✓O10

Datapoint CRT Terminals



Fully-Assembled — Guaranteed

#3360 \$649.50

refurbished

- Add \$15 packing.
- Shipped FOB Washington, D.C. Terms check, M.O. or charge.
- 90-day guarantee
- Scrolling version \$695.00
- Model 3360 speeds from 300-4800 Baud, numeric keypad, cursor controls, Edit, Block-Transmit, search modes. ASCII Keyboard with codeable options. Green phosphor, 80 x 24 ch lines, addressable cursor; RS-232C serial interface; other speeds available. Manual \$10; cable kit \$9.95. Datashare/IBM-2260 compatible version \$1,100.00. • Model 3000 \$825.00. M-33 ASR Teletype \$895. KSR \$725. All M-28, 35 components available, also Modems, readers. QUANTITY DISCOUNTS AVAILABLE. Leasing, service at low prices.

TELECOMMUNICATIONS SERVICES CO.

Box 4117, Alexandria, Va. 22303 ✓T26
703-683-4019 / TLX 89-623

TRS-80 OWNERS!

CASSETTE SOFTWARE FOR TRS-80

#1913-System Monitor—Write, Modify, De-bug and save machine language programs. Includes quick re-start feature if your program bombs. User manual & Z80 reference manual included. This is a separate package and cannot be combined with other programs for quantity discounts. Please specify if for 4K or 16K ram and for Level I or Level II. \$8.95 + .50 postage & handling.

#1825-Teletype Interface—Machine language program to send & receive Baudot TTY at 60 or 100 wpm using TRS-80 cassette plugs. Requires 2 common ICs, 2 operational isolators and +5 Vdc.

#0102-All-Star Baseball	#1402-Nim/Batnum
#0318-Craps/Reverse	#1305-Math Educator
#1812-Real-Time Lander	#2321-Wumpus
#1920-Star Trek-(4K or 16K Level I or 16K Level II only)	
#0612-File Locator	#1518-Oriental Rings
#0218-Biorhythm	

Order by Cat. No. and Name. All programs run in minimum 4K Level I or Level II except as noted. If ordering for Level II, add "II" after Cat. No. and "Level II" after name. Level I will be shipped unless specified! Prices: \$7.95 ea., \$13.95 for 2, \$23.95 for 4, 6 or more \$5.00 ea. Please include \$.50 for each program for postage & handling. Check, Money Order, Visa or Master Charge only. No C.O.D.

In the works—Available soon will be a series Small Business programs for the 32K System using mini-discs and line printer. We'll keep you posted.

Esstoo-Deetoo Products ✓E29
P.O. Box 6128 Shreveport, LA 71106

TRS - 80

SPECIAL PROMOTION SALE

SAVE 10%, 15% or more on ALL Computers, Peripherals, Software, and ALL other fine Radio Shack® products.

NO TAXES on out-of-state shipments.

FREE Surface delivery in U.S. **WARRANTIES** will be honored by your local Radio Shack® store.

Offered exclusively by
Radio Shack®
Authorized Sales Center
1117 Conway
Mission, Texas 78572
(512) 585-2765



✓P38



UNUSUAL SOFTWARE FOR TRS-80!

\$10.00* EACH, ON CASSETTE GAMES AND INSTRUCTIONAL PROGRAMS

• GT-4 TURKEY BUZZARD—This game will amaze you! Not only does it have an interesting, challenging and amusing scenario, but it is perhaps the only game in existence which makes full use of all TRS-80 graphics functions. Thus, you can actually "see" events encountered in the game! There is even some character animation! Watch your hunting dog chase his prey! See game birds fly from their tree roosts! There are all kinds of dangers and comic pitfalls to avoid. Definitely a game worthy for any true computer gamester!

• GT-6 DRIVER'S ED—This can either serve as an instructional aid for high school age youngsters learning to drive or as a fun, educational game for younger children. Features include: extensive use of graphics, informing user of correct answer when he or she misses a question, and randomization of question order to insure that the testee cannot answer using a pattern. Actually shows a picture of each subject it asks a question about.

A PROGRAM FOR SPACE BUFFS

• CS-4 PLANETARY WEIGHT—Tell the computer how much you weigh and it will tell you what you would weigh on seven other planets and the moon!

ALSO

• BT-1 BLANK (LEADERLESS) CASSETTES—Don't lose programs or data on file because you forgot to advance the tape beyond the leader! High quality. Our extensive tests have shown that this special leaderless cassette is best for computer use because it also has an extremely low incidence of "drop outs", even when compared with the most expensive low noise cassettes. Package of two for \$4.00.

*Add \$1.00 postage and handling. All programs executable in less than 4K RAM. Choose Level I or II. Available exclusively from

Computrex ✓C86
PO Box 536 Inman SC 29349

TARBELL CASSETTE or DISK BASIC only \$36.00

Most features of ALTAIR* Extended BASIC are included **PLUS** these added features:

- Assignment of I/O
- Alphanumeric line labels are allowed
- Read and write string data
- Unlimited length of variable names and strings
- Procedures with independent variables
- Number system 10 digits BCD integer or floating point
- Included are commands unique to Tarbell BASIC which provide capabilities to:
- Chain to another program • Assign a physical device to

- a logical device • Drop an I/O channel previously assigned
- Cause programs to be appended onto programs already in memory • Call a procedure and pass variables on the list • Cause interpreter to enter edit mode using 15 single character edit commands.

Tarbell BASIC occupies 21K of RAM.

Tarbell BASIC on cassette - \$36

Tarbell BASIC on CP/M Disk - \$36

Tarbell BASIC Source on paper - \$25

Tarbell BASIC Source on CP/M Disk - \$25

Tarbell
Electronics

950 DOVLEN PLACE, SUITE B
CARSON, CA 90746
(213) 538-4251 • (213) 538-2254

*Trademark/Tradename of Pertec Computer Corp.

CP/M is a Trademark/Tradename of Digital Research.

✓T11 Reader Service—see page 147

16K Static RAM \$275

450ns, for 300ns add \$50. • Phantomable • Bank switching

8K Static RAM \$119

450ns, for 250ns add \$30 • Pantomable • Optional MWRITE generation

16K EPROM \$213

450ns • Without EPROMS: \$69 • Power-On Jump • Each EPROM individually addressable on any 1K boundary • Uses 2708s • The Byte Board, The best EPROM board yet!

EPROM ERASER \$35

32 EPROM capacity • Fast • Reliable • Well made • Not a kit • The Byte Eraser, your best buy in an eraser!

DVC/Tarbell Cass I/O \$89

His board, our selected & matched parts.

And more! Call or write for our complete catalog. All modules are full socketed, and S-100 compatible. The above module prices are for KITS; for assembled and tested modules add \$30. We ship within 48 hours for MO or COD. CA residents add 6%.

DVC Data Vector Corporation
P.O. Box 3141 • Burbank CA 91504
(213) 842-2866

Key Electronics



Full ASCII Professional Keyboard Kit, Model 756



• Full 128 Character ASCII • Tri-Mode MOS Encoding • MOS/DTL/TTL Compatible Output • Two-Key Rollover • Level and Pulse Strobe • Shift and Alpha Lock • Selectable Parity • Positive or Negative Logic • All New, OEM Grade Components • Gold Contact, Low Bounce Key Switches • Rugged G-10 Printed Circuit Board • Low Power Consumption ... and More

Model 756 Keyboard Kit \$64.95
Model 701 Plastic Enclosure \$14.95
Model 702 Steel Enclosure \$29.95

Send for catalogues of other NEW merchandise, Semis, Sockets, ICs, Res., Caps, and MORE.

N.Y.S. Residents Add 4% Sales Tax

Send to: Key Electronics
P.O. Box 3506
Schenectady, NY 12303

✓ K14

RECYCLE(D) COMPUTERS

BUY ★ SELL ★ SWAP

Hardware & Software

NEW PRODUCT ANNOUNCEMENTS

22 pages

Mailed 1st Class every 3 Weeks

1 yr. (18 issues) ★ \$3.75

ON LINE



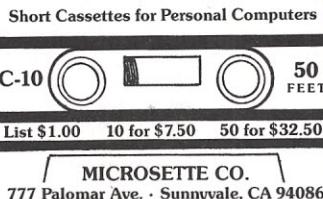
✓ 02

Dave Berlin, Publisher Established 1973

24695 Santa Cruz Hwy. • Los Gatos, CA 95030

THE BEST WAY TO DETERMINE IF ON LINE CAN BE OF VALUE TO YOU IS TO TRY A ...

FREE SAMPLE ISSUE

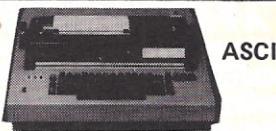


Duplication Services

Microsette also offers professional duplication services for Commodore PET and Radio Shack TRS-80 Level I and Level II cassettes. Our service provides mastering, quality control, all material including two-piece box, affixing of your labels or supplying our blank labels and shipping. Prices start at \$1.00 each in 100 quantity.

MICROSETTE CO. ✓ M67
777 Palomar Ave. • Sunnyvale, CA 94086

SURPLUS ELECTRONICS



IBM SELECTRIC BASED I/O TERMINAL WITH ASCII CONVERSION INSTALLED \$645.00

- Tape Drives • Cable
- Cassette Drives • Wire
- Power Supplies 12V15A, 12V25A, 5V35A Others, • Displays
- Cabinets • XFMRS • Heat Sinks • Printers • Components

Many other items
Write for free catalog
WORLDWIDE ELECT. INC. ✓ W16
130 Northeastern Blvd.
Nashua, NH 03060
Phone orders accepted using VISA
or MC. Toll Free 1-800-258-1036
In N.H. 603-889-7661

TRS-80 LEVEL II 16K, 8K PET T.M.* programs

MULTIPLE REGRESSION: easily handles 20 or more independent variables. Analysis of Variance, Durbin-Watson, Least Squares or Ridge estimates, transformation of variables, sub-set estimation, and much, much more \$17.95

LINEAR PROGRAMMING: easily handles 30 variables and 30 constraints. \$15.95

PERT: Critical Path determination, easily handles 500 activities (arcs). \$14.95

ZERO-ONE INTEGER PROGRAMMING: finance, production, and marketing applications \$13.95

TRANSPORTATION ALGORITHM: production applications. \$12.95

HEURISTIC LINE BALANCING: determination of station layout. \$11.95

All programs are extensively documented and enable the user to edit, save, and recall data.

*Program specifications may vary slightly.

Check or Money Order. S.C. Residents 4% Sales Tax



p.o. box 628
charleston sc
29402

TRS-80 LEVEL II AND DOS

RENUMBER PROGRAMS WITH 'REMODEL'

RENumber any section or an entire program. MOve any section from one location to another. DElete any line or range of program lines. All line references readjusted as required.

***** This utility is an absolute NECESSITY *****

MERGE PROGRAMS WITH 'PROLOAD'

LOAD any portion of basic program from tape. COMBINE programs with renumber and merge. SAVE selected parts of programs on tape. CREATE and use library of subroutines.

Illustrated instructions, well DOCUMENTED

For REMODEL Order TS21B at \$24.95
For REMODEL + PROLOAD Order TS22B at \$34.95

Specify 16K, 32K, or 48K when ordering.

COPY SYSTEM TAPES WITH 'COPSYS'

COPY system (machine language object) tapes. MERGE object tapes to form single load module. VERIFY correct contents of system tapes.

DUPPLICATE valuable tapes before damage.

For COPSYS (Not DOS) Order TS24B at \$14.95

✓ R24

Check, VISA, M/C Calif. residents add 6%
RACET computes, 702 Palmdale, Orange, CA 92665

D.C. METRO AREA TYSONS CORNER, VIRGINIA

THE COMPUTER SYSTEMS STORE ✓ C73

MICROCOMPUTERS & PERIPHERALS HOME, SCHOOL & SMALL BUSINESS

FEATURING

Small Business Systems Complete with Application Software Including Word Processing

DEALERS FOR

Commodore Pet	Lear Siegler
Processor Technology	Diablo
Polyorphic	Texas Instruments
Cromemco	DEC
Southwest Technical	North Star
Micro-Computer	Anderson Jacobson
Business Systems, Inc.	Books & Magazines

1984 Chain Bridge Rd.
McLean, VA
703-821-8333



New Software:

INTELLIGENT MICRO-MOUSE ?

Let the purists argue whether this programmed graphic "mouse" has true artificial intelligence. Anyway it's certainly not a stupid mouse, and certainly it's a persistent mouse. It's able to learn and recognize intricate paths, starting from within a maze, and having escaped, it's able to find its way back into the maze! Three separate variations of "Micro-Mouse" are provided on a cassette. Each of them runs under Level I Basic in 4K of memory.

MICRO-MOUSE-\$10.00

Micro - Mega ✓ M54
P.O. BOX 6265 • ARLINGTON, VA 22206

(Virginia residents add 4% sales tax)

KIM™ BUS IS A WINNER!

AIM™, VIM™, (SYM)™, KIM™ OWNERS
(and any other KIM™ bus users) buy the
best 8K board available anywhere:

GRAND OPENING SPECIAL—HDE 8K

RAM—\$169! 3 for \$465.00!

100 hour burn in—low power—commercial/industrial
quality 90 day parts and labor warranty (reg. \$195.00!)

KIM-1 Computer \$179.00
KIM-4 Motherboards \$119.00

Also—turn your KIM™ (or relative) into the best 6502
development system available at any price. Expand with
HDE's full size floppy system with DOS/Editor/Assembler! If
you thought the ARESCO was powerful, try this one out.
Completely compatible with existing ARESCO source files.
Powerful editor/DOS command structure—new 2 pass as-
sembler. Industrial/commercial grade components with 90
day warranty. KIM bus compatible interface card—power
supply for 4 drives single drive—\$1995.00; dual drive
\$2750.00 (45 day del.)

Add 5% for shipping, VISA/Master Charge. Free
shipping on prepaid cashier's check orders.

PLAINSMAN MICRO SYSTEMS, Div. 5C Corporation:
P.O. Box 1712 Auburn AL 36830 (205) 745-7735

Dealers for OSI, COMMODORE, COMPUCOLOR,
ALTO'S ✓ P43

RELIABLE APPLE SOFTWARE NOW AVAILABLE ON CASSETTE

All programs are written in Integer BASIC & run in 16K
unless otherwise stated.

1. Rainbow's Pot of Gold, Vol. 1, 40 BASIC programs	\$49
2. Microchess - Graphic display, beginning to intermediate, Machine language and BASIC	15
3. Inventory - Holds approximately 140 items in 16K	35
4. Income Tax - 1040, Schedules A&B, requires 20K & Applesoft 1	25
5. Morse Code Trainer - Variable speed 1-100 wpm, uses Apple-soft 1	10
6. Appletalker - Gives your APPLE a voice, machine language	15
7. Speed Reading, Vols. 1-4, four programs designed to improve your reading speed	40
8. Galactic Battle - Low resolution, real time space battle	15
9. Apartment Building Investment Analysis - Analyzes the investment potential of an apartment building	15
10. Microproducts Assembler - Apple assembler machine language, uses 4K	20
11. Space Dungeon - Evolving adventure game	10
12. Appledream - Irish jig composing algorithm	10
13. Hi-Res Life - Converts original Game of Life, machine language, requires 24K	10
14. Applevision - High resolution graphics and music demo, machine language and BASIC	15
15. Blackjack - One or two players in low-res graphics, machine language and BASIC	10
16. Apple Checkbook - Complete checkbook balancing and reconciliation program	10

Software is available on disk for media charge of \$5.00.
Please add \$1.25 for postage and handling.
Send Check or Money Order, sorry no C.O.D., to:

RAINBOW COMPUTING INC.

10723 White Oak Ave., Dept. K.B.
Granada Hills, CA 91344
(213) 360-2171 ✓ R12

California Residents add 6% sales tax
Allow 3-4 weeks for delivery

NEW WINTER PRICES OSI 48 PIN BUS COMPATIBLE PRODUCTS

8K STATIC MEMORY

350ns. Low Power 2102 Rams, Two independent
4K blocks, Dip switch address selection, Fully
socketed, 28 Decoupling capacitors, Complete
documentation

High-volume component buy brings prices down
Was **New Price**

Assembled and Tested	\$198	\$178
Buy 2 and SAVE	\$375	\$335
Complete Kit of all	\$175	\$145
parts with documentation	\$39	\$33

Bare PC board \$1.30 ea.
64 and up

NO. 96 PROTOTYPE BOARD

Build that custom circuit today. No. 96 Proto-
type board holds up to 96 14 or 16 pin devices
or 40 24 pin or 24 40 pin devices. Use board
in various combinations. Molex connectors
used for 48 pin bus. Board provides for 36 I/O
connections using Molex connectors or use
Dip Plugs for 120 I/O connections. Space
provided for 25 decoupling capacitors.

NO. 96 PROTOTYPE BOARD \$25

D&N MICRO PRODUCTS

3932 OAKHURST DR ✓ D34

FORT WAYNE, IND. 46815
TERMS: Check or money order. Add \$1 shipping and
handling. Indiana residents add 4% sales tax.

DEALER INQUIRIES INVITED

North Star Software

Mailist

Mailist is a general purpose mailing label program capable of
producing formatted lists for tractor-fed or Xerox type labels.
Mailist will also sort lists for any field.

Price \$39.95 on diskette with manual/stock to 14 day delivery.

In-out driver

Dos in-out driver is designed to set up mapped memory video
boards in conjunction with hard copy device. The user may
switch output under software control. Any file directory may be
listed while in BASIC without jumping to dos. Spacebar will stop
output for line by line listings. Designed for use with 3P+S and any
tv board.

Price \$12.95 on diskette with manual/stock to 14 day delivery.

Register

Register is a cash register and inventory control program. The
software will control a point of sale terminal and printer. It will
search inventory for an item, price and ticket it. Register has
provisions for min-max, automatic reorder, and critical list.

Price \$299.95 on diskette with manual.

All prices are FOB Santa Barbara, California.
Terms COD Residents add 6% sales tax and \$1.00 shipping.

Alpha Data Systems ✓ A48

Box 267, Santa Barbara, Ca. 93102 ■ 805/682-5693

ATTENTION NORTH STAR USERS

• **ARIAN:** 8080/2-80 Operating System, Assembler, Text
Editor Debugger, Dynamic File Capabilities. Save & Load
Source/OBJ. Files to Disk. Resident and Custom Com-
mands. Truly a powerful, yet easy to use Operating System.
= = => \$50.00

• **INVESTMENT PACK:** Stocks, Bonds, etc. Statistical
Analysis, Portfolio Management, Options, much more.
= = => \$25.00

• **FAMILY PACK:** Programs for home and family. Includes
Mail List, Phone List, Recipe Analysis, Home Budget,
much more.
= = => \$25.00

• **ASSEMBLY LANGUAGE PROGRAMMING COURSE:** Level
#1, beginners. Tired of not understanding Assem. Lang.
programs? Get this course and begin writing your own code.
= = => \$25.00

• **TYPING COURSE:** If you're still using "hunt and peck" then
you need Supersoft's Typing Course!
= = => \$25.00

• **RDA—DATA SYSTEM:** A complete data base manager,
unlimited cross-referencing, very fast access time (less
than 0.5 sec.).
= = => \$45.00

(Illinois residents add 5% sales tax)

SUPERSOFT ✓ S61
P.O. Box 1628, Champaign, IL 61820



ANOTHER GREAT DEAL FROM...
Computer Corner of New Jersey
240 Wanaque Ave., Pompton Lakes, N.J. 07442
(201) 835-7080
MASTER CHARGE & VISA
C64 ACCEPTED

THE COMPUTER CORNER

White Plains Mall, Upper Level
200 Hamilton Ave.
White Plains NY 10601
Phone: (914) WH9-DATA

Near Bronx River Parkway &
Cross Westchester Expressway.
Plenty of parking.

"The S100 Bus stops at
White Plains" with one of
the largest collections of boards
compatible with the Altair Bus
(also IMSAI) in the greater NY
area.

You've read about the
Sol-20, now come up and
see it. We carry Processor Tech,
Polymorphic, IMSAI, North Star,
TDL, Blast Master and Pickles
and Trout.

GOOD PRICE AND SERVICE
10-6 Mon.-Sat.
Thurs. till 9 ✓ C28

THE COMPUTER CORNER

TRS-80 COMPUTING

non profit newsletter

12 Issues For \$15.00

(US)

and now

PEOPLE'S SOFTWARE

at popular prices

- 25 cents per program plus 1 dollar per tape
- Tape #1 includes 26 Level I business/home/education programs, just \$7.50 plus 50 cents postage and handling (CA residents add 45 cents tax)
- Write for information

CIE ✓ C104
COMPUTER
INFORMATION
EXCHANGE

Box 158 San Luis Rey, CA 92068

FREE CODING SHEETS

- Cut the time from initial coding to production by allowing a better view of program organization and coding errors.
- High quality BASIC coding sheets at a price that encourages you to use them.
- Eye-ease brown grid and shading "keys" each line for enhanced readability.

50-8½" x 11" sheets to a pad.

1 pad for \$2.10 + .75 shipping
2 pads for \$3.95 + 1.00 shipping
5 pads for \$9.50 + 1.35 shipping

Mass. residents add 5% sales tax

Send check or money order

cpu COMPUTER
PACKAGES ✓ C103
UNLIMITED

99 Reservoir St. Holden, MA 01520
(617) 829-2570 Div. of SCB Inc.

For FREE SAMPLE packet circle our number
on the reader service card or request direct.

8K BASIC for KIM-1

The famous high speed *Microsoft BASIC* is now available for KIM-1. The 9-digit accuracy version is available on cassette or paper tape.

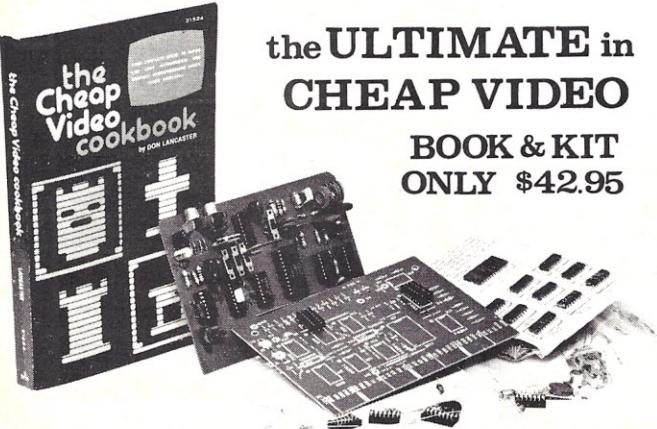
DELIVERY FROM STOCK.

\$99.00

\$2.00 shipping and handling

JOHNSON COMPUTER

P.O. BOX 523
MEDINA, OHIO 44256 (216) 725-4560



**the ULTIMATE in
CHEAP VIDEO
BOOK & KIT
ONLY \$42.95**

Don Lancaster's "Cheap Video" concept allows almost unlimited options, including:

- * Scrolling. Full performance cursor.
- * Line/Character formats of 16/32, 24/80, 32/64.... or almost anything.
- * Graphics - up to 256 X 256 B&W; 96 X 128 COLOR (requires low-cost option modules)
- * Works with 6502, 6800 and other micros.

SPECIAL OFFER: Buy the Kit (upper case alpha-numeric option included) & get the Book at 1/2 price.

PS **PSA** ELECTRONICS, DEPT. K, 1020 W. WILSHIRE BLVD., OKLAHOMA CITY, OK 73116

I'm Sold, PLEASE RUSH.....

SEND FREE CATALOG

TTV-658 Kit & Cheap Video Cookbook - \$42.95
 TTV-658 Kit only (book required for assembly) - \$39.95

name: _____

address: _____

city: _____ state: _____ zip: _____

PSA ELECTRONICS, DEPT. K, 1020 W. WILSHIRE BLVD., OKLAHOMA CITY, OK 73116

MICRODESK®



**The perfect home
for a personal or business computer**

MICRODESK \$139.50

48" x 24" x 26", Shelves 23" x 23", One adjustable.
See it at your computer store or order it from:

COMPUTER SYSTEMS DESIGN
906 N. Main Wichita, Kansas 67214

DEALER INQUIRIES INVITED

LEVEL IV
32020 Cheboygan **L19**
Westland, Mich. 48185 **(313) 326-0386**
FOR THE PROFESSIONAL USE OF THE TRS-80™.

General Ledger

Single Entry type, permits you to keep track of your incoming and outgoing checks..... \$99.00

Mailing Lister

Permits you to keep your clients all in one file and select up to 5 different types of mailings to send out. Both labels and clients journal. 2 types of sorts, zip and name..... \$49.00

Inventory Control

Giving you printouts of in-stock, and cost breakdown of orders. Also keeps track of vendors, min. orders and more..... \$99.00

All of the above programs are on disk and come with full instructions. All programs are user oriented, so you don't have to be a programmer.

GAMES

Micro Chess By Peter Jennings. The best computer game for the TRS-80TM..... \$19.95

Space Battle

Based on Star Trek but better. This may be the most-wanted game for the TRS-80TM. A graphic war game in Level II. This copyrighted game is available in Level I. This is the original one written by Rick Papo..... \$10.00

Final Approach

Aircraft simulator. In full graphics brings this jet plane down to the ground, but watch out for the small problems that come up, like a cabin fire and more. Level I and Level II on one tape..... \$10.00

Galaxy Target

Shoot down the alien machine but don't lose all your power. Bonus game on the back side, both Level II 4K..... \$10.00

UTILITIES

Renumber Renumber your Level II programs. Gives you a printout to the screen or line printer, also..... \$20.00

ASCII Compare

Compares two different ASCII stored program files. Producing a third file of the differences. Great when version two or your program doesn't work and you forgot what you changed..... \$5.00

Newlist

Display ASCII Files to screen or printer (60 lines per page). If file is basic program, it will break each line to individual instructions..... \$5.00

Where Was It

Examines an ASCII file (program) for key words you select (up to 100 different). Useful for conversions from one basic to another..... \$5.00

Level I Relocated in Level II RAM

Have the best of both worlds. A Level I machine and a Level II in the same machine without avoiding your warranty. Cassette or disk..... \$20.00

All the above Utilities programs are sold on disk (disk \$5.00 extra)

Hardware

Memory for TRS-80TM 4116's Full Instructions and Dip Shunts..... \$109.00

TRS-80TM Schematic for Keyboard..... \$5.00

TRS-80TM Interface Schematic..... \$5.00

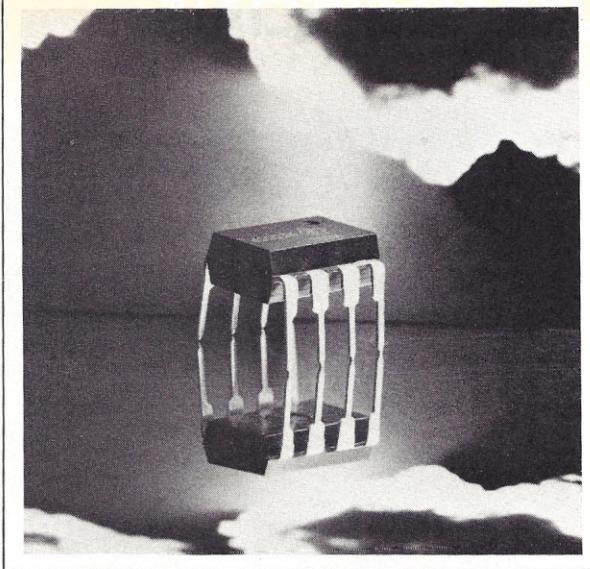
Diskette ... Each..... \$5.00

Diskette ... Box of 10..... \$45.00

TRS-80TM Keyboard and Monitor/Interface Cover..... \$15.00

Please add 75¢ Postage per Order. Michigan Residents add 4% Sales Tax.

FOR MORE INFORMATION ON ANY PROGRAM JUST WRITE



THE BEST FOR BOTH WORLDS

Factory prime electronic equipment for both the discerning hobbyist and the professional

The New Hobby World Catalog

✓ H25

Your source for factory prime, professional quality equipment. Computers, add-on boards, IC's, sockets, resistors, supplies, tools, test equipment, books, and more. Shop your buy list at Hobby World. You'll find what you want, and at a solid savings.

This month's specials.

16K MEMORY ADD-ON FOR APPLE OR TRS-80

Hobby World price is only **\$128.00** (specify when ordering)

NEW FROM SSM. THE CB-1 8080 CPU BOARD AT A HOBBY WORLD SUPER SPECIAL. (See SSM ad for specs) It's Loaded. It's Blue. IT'S ONLY **\$119.95**

THE NEW ELENCO 3½ DIGIT SOLID STATE MULTIMETER

The ultimate in performance: measures resistance to .01 ohms, voltage to 100 micro-volts, current to one micro-amp. Assembled and tested, with 2-Year warranty. Lists at **\$99.95**. Hobby World: **\$74.95**

WAHL ISO-TIP CORDLESS SOLDERING IRON

Includes ni-cad batteries and wall plug transformer. Lists at **\$19.95**, but Hobby World has it for **\$14.95!**

S-100 WIRE WRAP BOARD

Over 3600 holes, for super versatility. Provisions for 4 regulators. Double-sided, plate-through. All S-100 pins labelled for number and signal. The PT-1. Hobby World Price: Only **\$30.00**

Hobby World
19355 Business Center Drive #6
Northridge, CA 91324

TELEPHONE ORDERS
Inside Calif: 213 886-9200
Outside Calif: 800 423-5387

Order by mail. Just write. Or order by phone. Toll free outside California.

SEND ME A CATALOG!

Name _____

Address _____

City _____ State _____

Satisfaction 100% Guaranteed



Hobby World Carries TAB Books! Affordable books for the hobbyist. Hobby World helps out with a 10% discount. (Order by number, and don't forget the 10% discount)

Computer Circuits and How They Work	LIST PRICE #538	\$5.95
Beginner's Guide to Computer Logic	#548	\$5.95
Computer Technician's Handbook	#554	\$9.95
Build Your Own Working Robot	#841	\$5.95
Programming Microprocessors	#985	\$6.95
Beginner's Guide to Computer Programming	#574	\$9.95
Digital Electronics: Principles and Practice	#585	\$5.95
Microprocessor/Micro-programming Handbook	#785	\$6.95
Computer Programming Handbook	#752	\$9.95

SEND ME THE FOLLOWING SPECIALS!

Item	Quantity	Price

Postage/Handling \$1.50

California Residents add 6% Sales Tax
Charge My MC # _____
VISA _____

Signature _____

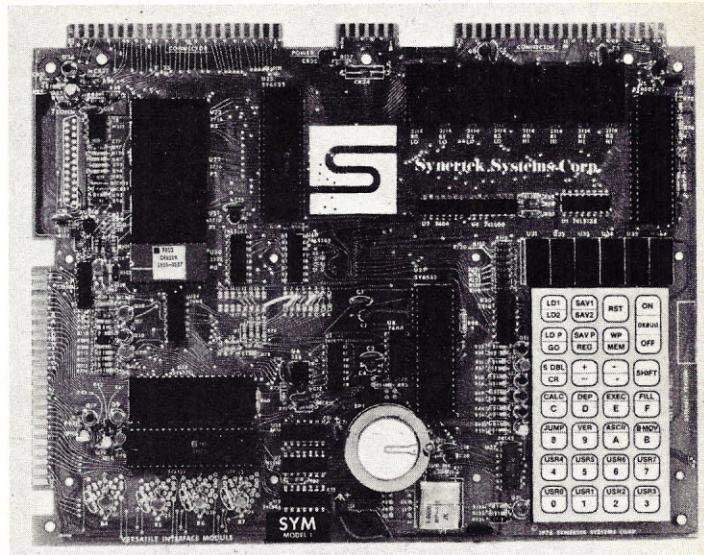
Expiration _____

CHRISTMAS/HANUKKAH SPECIALS

SYM-1, 6502-Based Microcomputer

- FULLY-ASSEMBLED AND COMPLETELY INTEGRATED SYSTEM that's ready-to-use
- ALL LSI IC'S ARE IN SOCKETS
- 28 DOUBLE-FUNCTION KEYPAD INCLUDING UP TO 24 "SPECIAL" FUNCTIONS
- EASY-TO-VIEW 6-DIGIT HEX LED DISPLAY
- KIM-1* HARDWARE COMPATIBILITY
- The powerful 6502 8-Bit MICROPROCESSOR whose advanced architectural features have made it one of the largest selling "micros" on the market today.
- THREE ON-BOARD PROGRAMMABLE INTERVAL TIMERS available to the user, expandable to five on-board.
- 4K BYTE ROM RESIDENT MONITOR and Operating Programs.
- Single 5 Volt power supply is all that is required.
- 1K BYTES OF 2114 STATIC RAM onboard with sockets provided for immediate expansion to 4K bytes onboard, with total memory expansion to 65, 536 bytes
- USER PROM/ROM: The system is equipped with 3 PROM/ROM expansion sockets for 2316/2332 ROMs or 2716 EPROMs
- ENHANCED SOFTWARE with simplified user interface
- STANDARD INTERFACES INCLUDE:
 - Audio Cassette Recorder Interface with Remote Control (Two modes: 135 Baud KIM-1* compatible, Hi-Speed 1500 Baud)
 - Full duplex 20mA Teletype Interface
 - System Expansion Bus Interface
 - TV Controller Board Interface
 - CRT Compatible Interface (RS-232)
- APPLICATION PORT: 15 Bi-directional TTL lines for user applications with expansion capability for added lines
- EXPANSION PORT FOR ADD-ON MODULES (51 I/O Lines included in the basic system)
- SEPARATE POWER SUPPLY connector for easy disconnect of the d-c power
- AUDIBLE RESPONSE KEYPAD

*KIM is a product of MOS Technology



SynerTek has enhanced KIM-1* software as well as the hardware. The software has simplified the user interface. The basic SYM-1 system is programmed in machine language. Monitor status is easily accessible, and the monitor gives the keypad user the same full functional capability of the TTY user. The SYM-1 has everything the KIM-1* has to offer, plus so much more that we cannot begin to tell you here. So, if you want to know more, the SYM-1 User Manual is available, separately.

SYM-1 Complete w/manuals	\$269.00
SYM-1 User Manual Only	7.00
SYM-1 Expansion Kit	75.00

Expansion includes 3K of 2114 RAM chips and 1-6522 I/O chip.

SYM-1 Manuals: The well organized documentation package is complete and easy-to-understand

SYM-1 CAN GROW AS YOU GROW. Its the system to BUILD-ON. Expansion features that are soon to be offered:

8K Basic ROM	\$159.00
TV Interface Board	\$349.00

SPECIALS—Good November 1978 to January 1979 ONLY

No. 1 The Huddle

SYM-1 Microcomputer	\$269.00
VCP-1 Power Supply	41.50
List	\$310.50
Special	\$295.00

No. 2 The Line-up

SYM-1 Microcomputer	\$269.00
VAK-1 Motherboard	129.00
VAK-EPS Power Supply	125.00
List	\$523.00
Special	\$495.00

**MERRY CHRISTMAS
HAPPY HANUKKAH
AND HAPPY NEW YEAR**

No. 3 The Second-half

VAK-1 Motherboard	\$129.00
VAK-4 16K RAM Board	379.00
VAK-EPS Power Supply	125.00
List	\$633.00
Special	\$599.00

No. 4 The Whole Game

SYM-1 Microcomputer	\$269.00
SYM-1 Expansion Kit	75.00
VAK-1 Motherboard	129.00
VAK-4 16K RAM Board	379.00
VAK-EPS Power Supply	125.00
List	\$977.00
Super Special	\$899.00

QUALITY EXPANSION BOARDS DESIGNED SPECIFICALLY FOR KIM-1, SYM-1, & AIM 65

These boards are set up for use with a regulated power supply such as the one below, but, provisions have been made so that you can add onboard regulators for use with an unregulated power supply. But, because of unreliability, we do not recommend the use of onboard regulators. All I.C.'s are socketed for ease of maintenance. *All boards carry full 90-day warranty.*

All products that we manufacture are designed to meet or exceed industrial standards. All components are first quality and meet full manufacturer's specifications. All this and an extended burn-in is done to reduce the normal percentage of field failures by up to 75%. To you, this means the chance of inconvenience and lost time due to a failure is very rare; but, if it should happen, we guarantee a turn-around time of less than forty-eight hours for repair.

Our money-back guarantee: If, for any reason you wish to return any board that you have purchased directly from us within ten (10) days after receipt, complete, in original condition, and in original shipping carton; we will give you a complete credit or refund less a \$10.00 restocking charge per board.

VAK-1 8-SLOT MOTHERBOARD

This motherboard uses the KIM-4* bus structure. It provides eight (8) expansion board sockets with rigid card cage. Separate jacks for audio cassette, TTY and power supply are provided. Fully buffered bus.

VAK-1 Motherboard \$129.00

VAK-2/4 16K STATIC RAM BOARD

This board using 2114 Rams is configured in two (2) separately addressable 8K blocks with individual write-protect switches.

VAK-2 16K RAM Board with only \$239.00

8K of RAM (½ populated)

VAK-3 Complete set of chips to \$175.00
expand above board to 16K

VAK-4 Fully populated 16K RAM \$379.00

*KIM is a product of MOS Technology

VAK-5 2708 EPROM PROGRAMMER

This board requires a +5 VDC and +12 VDC, but has a DC to DC multiplier so there is no need for an additional power supply. All software is resident in on-board ROM, and has a zero-insertion socket.

VAK-5 2708 EPROM Programmer \$269.00

VAK-6 EPROM BOARD

This board will hold 8K of 2708 or 2758, or 16K of 2716 or 2516 EPROMs. EPROMs not included.

VAK-6 EPROM Board \$129.00

VAK-7 COMPLETE FLOPPY-DISK SYSTEM (Feb. '79)

VAK-8 PROTOTYPING BOARD

This board allows you to create your own interfaces to plug into the motherboard. Etched circuitry is provided for regulators, address and data bus drivers; with a large area for either wire-wrapped or soldered IC circuitry.

VAK-8 Prototyping Board \$49.00

POWER SUPPLIES

ALL POWER SUPPLIES are totally enclosed with grounded enclosures for safety, AC power cord, and carry a full 2-year warranty.

FULL SYSTEM POWER SUPPLY

This power supply will handle a microcomputer and up to 65K of our VAK-4 RAM. ADDITIONAL FEATURES ARE: Over voltage Protection on 5 volts, fused, AC on/off switch. Equivalent to units selling for \$225.00 or more.

Provides +5 VDC @ 10 Amps & +12 VDC @ 1 Amp

VAK-EPS Power Supply \$125.00

**KIM-1* Custom P.S. provides 5 VDC @ 1.2 Amps
and +12 VDC @ .1 Amps**

KCP-1 Power Supply \$41.50

SYM-1 Custom P.S. provides 5 VDC @ 1.4 Amps

VCP-1 Power Supply \$41.50



2967 W. Fairmount Avenue
Phoenix AZ. 85017
(602)265-7564



Enclosed: check M.O. Charge: VISA Master Charge All Items Shipped Prepaid Ups

Card #: _____ Interbank #: _____

Expiration date: _____ Signature: _____

QTY	ITEM	PRICE	QTY	ITEM	PRICE
K	SUB TOTAL			SUB TOTAL	
					TOTAL AMOUNT\$ _____
					AZ. RESIDENT MUST ADD SALES TAX\$ _____

ALL INTERNATIONAL ORDERS
SHIPPED FREIGHT CHARGES ADDITIONAL.

TOTAL AMOUNT OF ORDER\$ _____

NAME: _____

ADDRESS: _____

CITY: _____ STATE: _____ ZIP: _____

STAND
ALONE

VIDEO TERMINAL

Now, a completely self-contained video terminal card for less than \$150.00. Requires only an ASCII Keyboard and TV set to become a complete interactive terminal for connection to your computers serial I/O port. Two units available, common features are: single 5V supply, crystal controlled sync and baud rates (to 9600 baud), computer and keyboard operated cursor control, parity error and control, power on initialization, forward spaces, line feed, rev. line feeds, home, return cursor, and clear to end of line. Power requirements are 5V at 900ma, output std. IV p-p video and serial TTL level data.

Features: TH3216

Display 32 characters by 16 lines 2 pages

Characters Upper case ASCII Upper/lower case optional

Baud Rates 300-9600 110-9600

Controls Read to/from memory Scroll up or down

Price (kit) \$149.95 \$189.95

Above prices include all IC sockets

OPTIONS:

Power supply (mounts on board) \$14.95
Video/RF Modulator, VD-1 6.95
Lower case option (TH6416 only) 14.95
Assembled, tested units, add 60.00

Frequency Counter \$89.95 KIT

You've requested it, and now it's here! The CT-50 Frequency Counter Kit has more features than counters selling for twice the price. Measuring frequency is now as easy as pushing a button, the CT-50 will automatically place the decimal point in all modes, giving you quick, reliable readings. Want to use the CT-50 mobile? No problem, it runs equally as well on 12 VDC as it does on 110 VAC. Want super accuracy? The CT-50 uses the popular TV color burst freq. of 3.79545 MHz for time base. Tap off a color TV with our adapter and get ultra accuracy—.001 ppm! The CT-50 offers professional quality at the unheard of price of \$89.95. Order yours today!

PRICES

CT-50, 60 MHz Counter Kit. \$89.95
CT-50WT, 60 MHz counter, wired and tested. \$159.95
CT-600, 600 MHz prescaler option for CT-50, add. \$29.95

VIDEO TO RF MODULATOR

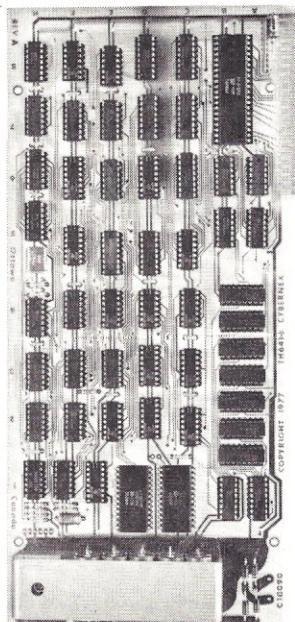
Convert any TV set to a video monitor. Super stable circuit is glitch-free, tunable over channels 4-6. Runs on 5-15V. Recommended by many computer manufacturers. Std. video input. Complete kit, VD-1 \$6.95

741 OP-AMP
MINI DIP 10/\$2.00



SPECIFICATIONS

Sensitivity: less than 20mV
Frequency range: 50Hz to 60MHz, typically 65MHz
Gate time: 1 second, 1/10 second, with automatic decimal point positioning on both direct and prescale
Display: 8 digit red LED, 4" height
Accuracy: 2 ppm, .001 ppm with TV time base!
Input: BNC, 1 meg ohm direct, 50 ohm with prescale option
Power: 110 VAC 5 watts or 12 VDC 6.4 Amp
Size: Approx. 6" x 4" x 2", high quality aluminum case



CYBERNET

"TH 6416 shown above"

MINI-KITS

FM WIRELESS MIKE KIT

Transmit up to 300' to any FM radio. Sensitive mike input requires dynamic, crystal or ceramic mike. Runs on 3 to 9 volts.

FM-1 \$2.95

TONE DECODER KIT

A complete tone decoder on a single PC Board. Features: 400 to 5000 Hz adjustable frequency, 1000 Hz bandpass, 1000 Hz low pass filter. Useful for touch-tone-decoding, tone burst detection, FSK demod, signaling, and many other applications. Input: 12 volt, 100 ohm telephone decoding. Runs on 5 to 12 volts.

Complete Kit, TD-1 \$4.95

LED BLINKY KIT

A great attention getter, which alternately flashes 2 jumbo LEDs. Use for alarm, buttons or warning type panel lights.

Complete Kit, BL-1 \$2.95

SUPER-SNOOP AMPLIFIER

A super-snooper which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as a general purpose test amplifier. Full 2 watts of output, runs on 6 to 12 volts, any type of milliamp. Requires 8-45 ohm speaker.

Complete Kit, BN-9 \$4.95

MUSIC LIGHTS KIT

See music come alive! 3 different lights flicker with music or voice. One light for low, one for the mid-range and one for the high. Each channel has its own volume, adjustable and drives up to 300 watts. Great for parties, band music, night clubs and more.

Complete Kit, ML-1 \$7.95

SIREN KIT

Produces upward and downward wall characteristic of police siren. 200mw audio output, runs on 3-9 volts, uses 8-45 ohm speaker.

Complete Kit, SM-3 \$2.95

POWER SUPPLY KIT

Complete triple output power supply provides voltages: +25 volts at 200ma and +5 volts at 1 amp. 50mV load regulation, good filtering and small size. Kit less transformer. Requires 6-12V at 1 amp and 18 to 30VCT.

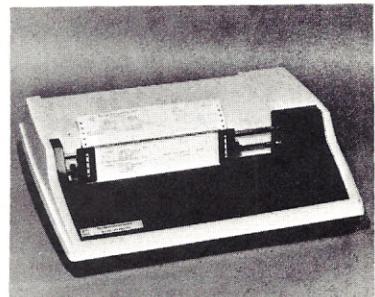
Complete Kit, PS-3LT \$6.95

THE END OF YOUR SYSTEM



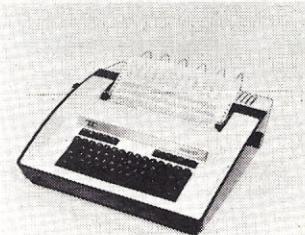
Put this SOROC IQ 120 at the end of your system for fast and silent input/output.

\$795 00*



Put this TI 810 printer at the end of your system for fast and reliable hard-copy output.

\$1695 00*



Put this TELETYPE 43 at the end of your system for reliable low-cost input/output.

\$999 00*

*plus 2% handling.
Shipped freight collect.



MICROMAIL • BOX 3297 • SANTA ANA, CA 92703

(714) 731-4338

Also DIABLO, LEAR/SIEGLER, DEC.
Write or call for a free catalogue.

Now, a completely self-contained video terminal card for less than \$150.00. Requires only an ASCII Keyboard and TV set to become a complete interactive terminal for connection to your computers serial I/O port. Two units available, common features are: single 5V supply, crystal controlled sync and baud rates (to 9600 baud), computer and keyboard operated cursor control, parity error and control, power on initialization, forward spaces, line feed, rev. line feeds, home, return cursor, and clear to end of line. Power requirements are 5V at 900ma, output std. IV p-p video and serial TTL level data.

Features: TH3216

Display 32 characters by 16 lines 2 pages

Characters Upper case ASCII Upper/lower case optional

Baud Rates 300-9600 110-9600

Controls Read to/from memory Scroll up or down

Price (kit) \$149.95 \$189.95

Above prices include all IC sockets

OPTIONS:

Power supply (mounts on board) \$14.95
Video/RF Modulator, VD-1 6.95
Lower case option (TH6416 only) 14.95
Assembled, tested units, add 60.00

Frequency Counter

\$89.95 KIT

You've requested it, and now it's here! The CT-50 Frequency Counter Kit has more features than counters selling for twice the price. Measuring frequency is now as easy as pushing a button, the CT-50 will automatically place the decimal point in all modes, giving you quick, reliable readings. Want to use the CT-50 mobile? No problem, it runs equally as well on 12 VDC as it does on 110 VAC. Want super accuracy? The CT-50 uses the popular TV color burst freq. of 3.79545 MHz for time base. Tap off a color TV with our adapter and get ultra accuracy—.001 ppm! The CT-50 offers professional quality at the unheard of price of \$89.95. Order yours today!

PRICES

CT-50, 60 MHz Counter Kit. \$89.95
CT-50WT, 60 MHz counter, wired and tested. \$159.95
CT-600, 600 MHz prescaler option for CT-50, add. \$29.95

VIDEO TO RF MODULATOR

Convert any TV set to a video monitor. Super stable circuit is glitch-free, tunable over channels 4-6. Runs on 5-15V. Recommended by many computer manufacturers. Std. video input. Complete kit, VD-1 \$6.95

741 OP-AMP
MINI DIP 10/\$2.00

ramsey electronics

R8

Box 4072K ROCHESTER NY 14610 (716) 271-6487

Satisfaction guaranteed
or money refunded
Order under \$10
add 75c. COD add
99.00. NY add 7%
sales tax.

128

STUDENTS & TEACHERS WITH YOUR ORDER, SEND PROOF OF YOUR STATUS AND RECEIVE 5% OF YOUR PRESENT ORDER AS A CREDIT CERTIFICATE YOU CAN USE ON YOUR NEXT ORDER.		FREE SOCKETS WITH PURCHASE OF ANY OF THESE I.C.'S.			
CHRISTMAS SPECIAL OF 5% OFF EFFECTIVE ON ALL ORDERS MAILED BEFORE DECEMBER 25, 1978.					
THE FIRST MEMORY SPECIAL YOU WON'T FORGET					
2102-2 650ns 8/95 32/3700 64/7100 128/13500 2102-4 450ns 8/105 32/4100 64/7800 128/14500 2114D 450ns 8/7900 16/14900 32/27400 64/49900					
PRESCALER - 250 MHZ complete \$2395 PRESCALER - 650 MHZ complete \$4995 11C90 - PRESCALER CHIP 650 mc \$1995		OPTO ISOLATORS 1. MCT2 \$.79 2. MOC1000 \$.89 3. 4N-26 \$.95 4. CL1422 \$ 1.49			
SOLID STATE RELAY • 400 V at 3 AMPS TTL COMPATIBLE • MICRO REED ACTUATED TO MINIMIZE CHANCES OF AC POWER SPILLOVER INTO LOGIC CIRCUITS \$395					
CHEAPER BY THE 100 LEDS- (HP AXIAL-RED) 100/8.95 LEDS- (MINI-RED) 100/9.95 LEDS- (JUMBO-RED) 100/13.95 LEDS- (DUAL COLOR) 100/59.00 1N4001- (50V-1 AMP) 100/ 4.95 1N4148- (SWITCHING DIODE) 100/ 3.95 2N3403- (N-JFET) 100/21.95 2N3392- (PRIME-NPN LOW NOISE) 100/ 9.95		REFLECTIVE PHOTO COUPLERS TIL-139 LED INTO PHOTO TRANSISTOR \$295 ROC100 INCANDESCENT INTO CDS CELL — 20 MEG OHM OFF RESISTANCE \$195			
AUDIO POWER AMPS SINGLE TDA-2020-20 Watt \$9.95 S11020H-20 Watt \$10.50 S11130H-30 Watt \$12.50 STK-50 -50 Watt \$18.95		STEREO STK433-5 Watts per channel \$6.95 STK435-7 Watts per channel \$9.95 STK437-10 Watts per channel \$11.95 STK439-15 Watts per channel \$13.95 STK441-20 Watts per channel \$16.95			
RAM 8080 SYSTEM 8080A 5.95 8212 3.75 8214 8.95 8216 3.50 8224 4.80 8226 4.75 8228 7.25 8238 8.25 8251 9.45 8253 21.50 8255 10.75 8257 20.50 8259 20.50		CPU's cont. 8008 8.95 8035 19.95			
8210 11.95 8210 11.95		RAM 7489 2.95 3101 3.95 8225 2.95 2101-1 2.95 2101-2 3.25 2101A-4 3.25 2102-2 1.50 2102L 1.95 82510 4.95 82511 4.95 5101-3 11.95			
82511 7.95 82512 4.95 82513 7.95 82514 4.95 82515 7.95 82516 4.50 82517 5.95 82518 6.95 82519 6.50		SHIFT REGISTERS C1402A 1.95 MM1403AH 1.95 MM5006AH 2.95 MM5050 3.95			
82520 3.95 82521 3.95 82522 3.95 82523 3.75 82524 5.95 82525 6.95 82526 7.25 82527 16.95 82528 16.95 82529 6.95 82530 7.25 82531 7.95 82532 7.95 82533 7.95 82534 7.95 82535 7.95 82536 7.95 82537 7.95 82538 6.95 82539 6.50		CLOCK CHIPS C17001 6.50			
82540 11.95 82541 3.95 82542 3.95 82543 3.95 82544 3.95 82545 3.95 82546 3.95 82547 3.95 82548 3.95 82549 3.95 82550 3.95 82551 3.95 82552 3.95 82553 3.95 82554 3.95 82555 3.95 82556 3.95 82557 3.95 82558 3.95 82559 3.95 82560 3.95		CALCULATOR CHIPS MM5725 1.95 MM5736 1.95 MM5738 1.95 MM5739 1.95 MCS2521 1.95			
82561 1.95 82562 1.95 82563 1.95 82564 1.95 82565 1.95 82566 1.95 82567 1.95 82568 1.95 82569 1.95 82570 1.95 82571 1.95 82572 1.95 82573 1.95 82574 1.95 82575 1.95 82576 1.95 82577 1.95 82578 1.95 82579 1.95 82580 1.95 82581 1.95 82582 1.95 82583 1.95 82584 1.95 82585 1.95 82586 1.95 82587 1.95 82588 1.95 82589 1.95 82590 1.95 82591 1.95 82592 1.95 82593 1.95 82594 1.95 82595 1.95 82596 1.95 82597 1.95 82598 1.95 82599 1.95 82600 1.95 82601 1.95 82602 1.95 82603 1.95 82604 1.95 82605 1.95 82606 1.95 82607 1.95 82608 1.95 82609 1.95 82610 1.95 82611 1.95 82612 1.95 82613 1.95 82614 1.95 82615 1.95 82616 1.95 82617 1.95 82618 1.95 82619 1.95 82620 1.95 82621 1.95 82622 1.95 82623 1.95 82624 1.95 82625 1.95 82626 1.95 82627 1.95 82628 1.95 82629 1.95 82630 1.95 82631 1.95 82632 1.95 82633 1.95 82634 1.95 82635 1.95 82636 1.95 82637 1.95 82638 1.95 82639 1.95 82640 1.95 82641 1.95 82642 1.95 82643 1.95 82644 1.95 82645 1.95 82646 1.95 82647 1.95 82648 1.95 82649 1.95 82650 1.95 82651 1.95 82652 1.95 82653 1.95 82654 1.95 82655 1.95 82656 1.95 82657 1.95 82658 1.95 82659 1.95 82660 1.95 82661 1.95 82662 1.95 82663 1.95 82664 1.95 82665 1.95 82666 1.95 82667 1.95 82668 1.95 82669 1.95 82670 1.95 82671 1.95 82672 1.95 82673 1.95 82674 1.95 82675 1.95 82676 1.95 82677 1.95 82678 1.95 82679 1.95 82680 1.95 82681 1.95 82682 1.95 82683 1.95 82684 1.95 82685 1.95 82686 1.95 82687 1.95 82688 1.95 82689 1.95 82690 1.95 82691 1.95 82692 1.95 82693 1.95 82694 1.95 82695 1.95 82696 1.95 82697 1.95 82698 1.95 82699 1.95 82700 1.95 82701 1.95 82702 1.95 82703 1.95 82704 1.95 82705 1.95 82706 1.95 82707 1.95 82708 1.95 82709 1.95 82710 1.95 82711 1.95 82712 1.95 82713 1.95 82714 1.95 82715 1.95 82716 1.95 82717 1.95 82718 1.95 82719 1.95 82720 1.95 82721 1.95 82722 1.95 82723 1.95 82724 1.95 82725 1.95 82726 1.95 82727 1.95 82728 1.95 82729 1.95 82730 1.95 82731 1.95 82732 1.95 82733 1.95 82734 1.95 82735 1.95 82736 1.95 82737 1.95 82738 1.95 82739 1.95 82740 1.95 82741 1.95 82742 1.95 82743 1.95 82744 1.95 82745 1.95 82746 1.95 82747 1.95 82748 1.95 82749 1.95 82750 1.95 82751 1.95 82752 1.95 82753 1.95 82754 1.95 82755 1.95 82756 1.95 82757 1.95 82758 1.95 82759 1.95 82760 1.95 82761 1.95 82762 1.95 82763 1.95 82764 1.95 82765 1.95 82766 1.95 82767 1.95 82768 1.95 82769 1.95 82770 1.95 82771 1.95 82772 1.95 82773 1.95 82774 1.95 82775 1.95 82776 1.95 82777 1.95 82778 1.95 82779 1.95 82780 1.95 82781 1.95 82782 1.95 82783 1.95 82784 1.95 82785 1.95 82786 1.95 82787 1.95 82788 1.95 82789 1.95 82790 1.95 82791 1.95 82792 1.95 82793 1.95 82794 1.95 82795 1.95 82796 1.95 82797 1.95 82798 1.95 82799 1.95 82800 1.95 82801 1.95 82802 1.95 82803 1.95 82804 1.95 82805 1.95 82806 1.95 82807 1.95 82808 1.95 82809 1.95 82810 1.95 82811 1.95 82812 1.95 82813 1.95 82814 1.95 82815 1.95 82816 1.95 82817 1.95 82818 1.95 82819 1.95 82820 1.95 82821 1.95 82822 1.95 82823 1.95 82824 1.95 82825 1.95 82826 1.95 82827 1.95 82828 1.95 82829 1.95 82830 1.95 82831 1.95 82832 1.95 82833 1.95 82834 1.95 82835 1.95 82836 1.95 82837 1.95 82838 1.95 82839 1.95 82840 1.95 82841 1.95 82842 1.95 82843 1.95 82844 1.95 82845 1.95 82846 1.95 82847 1.95 82848 1.95 82849 1.95 82850 1.95 82851 1.95 82852 1.95 82853 1.95 82854 1.95 82855 1.95 82856 1.95 82857 1.95 82858 1.95 82859 1.95 82860 1.95 82861 1.95 82862 1.95 82863 1.95 82864 1.95 82865 1.95 82866 1.95 82867 1.95 82868 1.95 82869 1.95 82870 1.95 82871 1.95 82872 1.95 82873 1.95 82874 1.95 82875 1.95 82876 1.95 82877 1.95 82878 1.95 82879 1.95 82880 1.95 82881 1.95 82882 1.95 82883 1.95 82884 1.95 82885 1.95 82886 1.95 82887 1.95 82888 1.95 82889 1.95 82890 1.95 82891 1.95 82892 1.95 82893 1.95 82894 1.95 82895 1.95 82896 1.95 82897 1.95 82898 1.95 82899 1.95 82900 1.95 82901 1.95 82902 1.95 82903 1.95 82904 1.95 82905 1.95 82906 1.95 82907 1.95 82908 1.95 82909 1.95 82910 1.95 82911 1.95 82912 1.95 82913 1.95 82914 1.95 82915 1.95 82916 1.95 82917 1.95 82918 1.95 82919 1.95 82920 1.95 82921 1.95 82922 1.95 82923 1.95 82924 1.95 82925 1.95 82926 1.95 82927 1.95 82928 1.95 82929 1.95 82930 1.95 82931 1.95 82932 1.95 82933 1.95 82934 1.95 82935 1.95 82936 1.95 82937 1.95 82938 1.95 82939 1.95 82940 1.95 82941 1.95 82942 1.95 82943 1.95 82944 1.95 82945 1.95 82946 1.95 82947 1.95 82948 1.95 82949 1.95 82950 1.95 82951 1.95 82952 1.95 82953 1.95 82954 1.95 82955 1.95 82956 1.95 82957 1.95 82958 1.95 82959 1.95 82960 1.95 82961 1.95 82962 1.95 82963 1.95 82964 1.95 82965 1.95 82966 1.95 82967 1.95 82968 1.95 82969 1.95 82970 1.95 82971 1.95 82972 1.95 82973 1.95 82974 1.95 82975 1.95 82976 1.95 82977 1.95 82978 1.95 82979 1.95 82980 1.95 82981 1.95 82982 1.95 82983 1.95 82984 1.95 82985 1.95 82986 1.95 82987 1.95 82988 1.95 82989 1.95 82990 1.95 82991 1.95 82992 1.95 82993 1.95 82994 1.95 82995 1.95 82996 1.95 82997 1.95 82998 1.95 82999 1.95 83000 1.95 83001 1.95 83002 1.95 83003 1.95 83004 1.95 83005 1.95 83006 1.95 83007 1.95 83008 1.95 83009 1.95 83010 1.95 83011 1.95 83012 1.95 83013 1.95 83014 1.95 83015 1.95 83016 1.95 83017 1.95 83018 1.95 83019 1.95 83020 1.95 83021 1.95 83022 1.95 83023 1.95 83024 1.95 83025 1.95 83026 1.9					

Visit our new retail location!
TOLL FREE 1 (800) 423-5633

Visit our new retail location!

TOLL FREE 1 (800) 423-5633
CA., AK., HI., (213) 893-8202

Visit our new retail location!

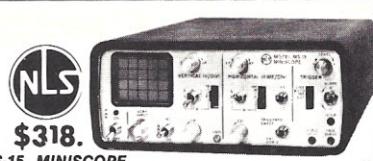


1¢
SALE

LM3A 3 dig 1% DC \$13.40
LM3.5A 3 1/2 dig .5% DC \$15.80
LM40A 4 dig .1% DC \$209.00
LM4A 4 dig .03% DC \$250.00

- Rechargeable batteries and charger included
- Measures DC Volts, AC Volts, Ohms and Current
- Automatic polarity, decimal and overload indication
- Rechargeable batteries and charger
- Measures DC Volts, AC Volts, Ohms and Current
- Automatic polarity, decimal and overload indication
- No zero adjustment and no full-scale ohms adjust
- Battery-operated — NiCad batteries; also AC line operation.
- Large LED display for easy reading without interpolation
- Size: 1.9" H x 2.7" W x 4" D
- Parts & labor guaranteed 1 year
- Tilt stand option \$3.50
- Leather case \$20.00

Purchase any of the LM series
Meters and buy the LEATHER CASE
for 1¢



\$318.

MS-15 MINISCOPE With Rechargeable Batteries & Charger Unit

- 15 megahertz bandwidth.
- External and internal trigger.
- Time base — 1 microsec. to 0.5 Sec/div - 21 settings ± 3%.
- Power consumption < 15 watts.
- Viewing area 1.1" x 1.35".
- Vertical scale 0.1 to 1000 V/div - 12 settings ± 3%.
- Case size 2.7" H x 6.4" W x 7.5" D, 3 pounds.
- Weight 3.5 lbs. • Parts & labor guaranteed 1 year
- 10 to 1, 10 meg probe \$27.
- Leather carrying case \$45.

• MS-215 Dual Trace Version of MS-15 \$435.

SALE S-100 BUS EDGE CONNECTORS SALE

\$100-WWG 50/100 Cont. 125 ctrs. 3 LEVEL WIRE WRAP .025" sq posts on 250 spaced rows. GOLD plated. 1-4 5-9 10-24 \$4.00 \$3.75 \$3.50

RGBIG 50/100 Cont. 125 ctrs. DIP SOLDER TAIL on 140 spaced rows for ALTAIR motherboards. GOLD plated. \$5.00

\$100-STG 50/100 Cont. 125 ctrs. DIP SOLDER TAIL on 250 spaced rows for VECTOR and MASI motherboards. GOLD plated. 1-4 5-9 10-24 \$4.00 \$3.75 \$3.50

R681-3 50/100 Cont. 125 ctrs. PLATED SOLDER EYELET tails. GOLD \$7.35

Other Popular Edge Connectors

R644-G 22/44 Cont. 156 ctrs. PLATED SOLDER EYELET tails. GOLD plated. 1-4 5-9 10-24 \$3.00 \$2.75 \$2.50

R644-3 22/44 Cont. 156 ctrs. WIRE WRAPS tails. GOLD \$4.71

ATTN: OEM'S and Dealers, many other connectors available call or quotation.

3 LEVEL GOLD WIRE WRAP SOCKETS

Sockets purchased in multiples of 50 per type may be combined for best price.

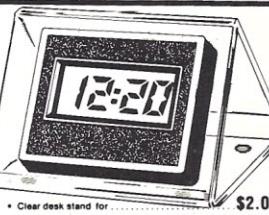
	1-24	25-49	50-99	100-249	250-999	1K-5K
8 pin*	.41	.38	.35	.31	.27	.23
14 pin*	.39	.38	.36	.32	.29	.27
16 pin*	.43	.42	.39	.35	.32	.30
18 pin	.63	.58	.54	.47	.42	.36
20 pin	.80	.75	.70	.63	.58	.53
22 pin*	.90	.85	.80	.70	.61	.57
24 pin	.90	.84	.78	.68	.63	.58
28 pin	1.10	1.00	.90	.84	.76	.71
40 pin	1.50	1.40	1.30	1.20	1.04	.89

All sockets are GOLD 3 level closed entry * End and side stackable. 2 level, Solder Tail, Low Profile, Tin Sockets and Dip Plugs available. CALL FOR QUOTATION



LIQUID CRYSTAL DIGITAL CLOCK-CALENDAR

- For Auto, Home, Office
- Small in size (2x2 1/2 x 1/2)
- Push button for seconds release for date.
- Clocks mount anywhere with either 3M double-sided tape or VELCRO® included.
- 2 sizes available
- LCD-101, portable model runs on self-contained batteries for better than a year.
- LCD-102, runs on 12 Volt system and is backlit.
- LCD-101 or LCD-102 your choice



\$34.95 .. Clear desk stand for \$2.00

8803
MOTHER
BOARD FOR
\$100 BUS
MICRO-
COMPUTERS



Price:
\$29.50

Vector
Plugboards

8800V

Universal Microcomputer/processor plugboard, use with S-100 bus. Complete with heat sink & hardware. 5.3" x 10" x 1/16" 1-4 5-9 10-24 \$19.95 \$17.95 \$15.96

3682 9.6" x 4.5"

\$10.90
3682-2 6.5" x 4.5"

\$9.74

Hi-Density Dual-Line Plugboard for Wire Wrap with Power & Grd. Bus Epoxy Glass 1/16" 44 pin con. spaced .156

3677 9.6" x 4.5"

\$7.65
3677-2 6.5" x 4.5"

\$11.45

Gen. Purpose D.I.P. Boards with Bus Pattern for Solder or Wire Wrap. P pattern plugboards for Epoxy Glass 1/16" 44 pin con. spaced .156

3662 6.5" x 4.5"

\$7.65
3662-2 9.6" x 4.5"

\$11.45

P pattern plugboards for IC's Epoxy Glass 1/16" 44 pin con. spaced .156

3690-12
CARD EXTENDER

Card Extender has 100 contacts-50 per side on .125 centers-Attached connector-is compatible with S-100 Bus Systems \$25.00
3690 6.5" 22/44 pin .156 ctrs. Extenders \$12.00

SLIT-N-WRAP

Wraps insulated wire on .025" square posts
FOUR TIMES FASTER
than regular manual wrap-post tools

P180
with two
100' spools
of 28 ga.
wire

\$24.50
P160-2
includes
charger, wire
\$75.00

"Daisy-chain" runs
Reliable and easy to use
Manual or power operation

SLIT-N-WRAP
12" Package
WIRE
NO. 26 GAGE INSULATED
WIRE, 100' SPOOLS

W28-2-Pkg 3. Green
W28-2-Pkg 3. Red
W28-2-0-Pkg 3. Blue

2708
8K 450 ns

EPROM
FACTORY PRIME

\$ 9.00 EA.

25 + Call For
Price

14 & 16 PIN
GOLD 3 LEVEL
WIRE WRAP
SOCKETS

14 - G3 100 for
\$30.00
16-G3 100 for
\$30.00
50 of each for \$32.00

Sockets are End & Side stackable,
closed entry

1/16 Vector BOARD
.042 dia holes on
0.1 spacing for IC's

Phenolic
PART NO. SIZE PRICE
64P44XXXX 4.5x6.5" \$1.49 1.34
169P44XXXX 4.5x17" \$3.51 3.16

Epoxy Glass
64P44 4.5x6.5" \$1.70 1.53
84P44 4.5x8.5" \$2.10 1.89
169P44 4.5x17" \$4.30 3.87
169P84 8.5x17" \$7.65 6.89

PANAVISE

LOW-PROFILE BASE

STANDARD BASE

VACUUM BASE

WIDE OPENING

HORIZONTAL JAW VISE HEAD

WIDE OPENING

VISE HEAD

LOCK SCREW
BASE

360°

303

PRICE: \$12.95

305

PRICE: \$11.95

306

PRICE: \$16.95

366

PRICE: \$12.95

315

PRICE: \$17.95

316

PRICE: \$16.95

317

PRICE: \$16.95

318

PRICE: \$16.95

319

PRICE: \$16.95

320

PRICE: \$16.95

321

PRICE: \$16.95

322

PRICE: \$16.95

323

PRICE: \$16.95

324

PRICE: \$16.95

325

PRICE: \$16.95

326

PRICE: \$16.95

327

PRICE: \$16.95

328

PRICE: \$16.95

329

PRICE: \$16.95

330

PRICE: \$16.95

331

PRICE: \$16.95

332

PRICE: \$16.95

333

PRICE: \$16.95

334

PRICE: \$16.95

335

PRICE: \$16.95

336

PRICE: \$16.95

337

PRICE: \$16.95

338

PRICE: \$16.95

339

PRICE: \$16.95

340

PRICE: \$16.95

341

PRICE: \$16.95

342

PRICE: \$16.95

343

PRICE: \$16.95

344

PRICE: \$16.95

345

PRICE: \$16.95

346

PRICE: \$16.95

347

PRICE: \$16.95

348

PRICE: \$16.95

349

PRICE: \$16.95

350

PRICE: \$16.95

351

PRICE: \$16.95

352

PRICE: \$16.95

353

PRICE: \$16.95

354

PRICE: \$16.95

355

PRICE: \$16.95

356

PRICE: \$16.95

357

PRICE: \$16.95

358

PRICE: \$16.95

359

PRICE: \$16.95

360

PRICE: \$16.95

361

PRICE: \$16.95

362

PRICE: \$16.95

363

PRICE: \$16.95

364

PRICE: \$16.95

365

PRICE: \$16.95

366

PRICE: \$16.95

367

PRICE: \$16.95

368

PRICE: \$16.95

369

PRICE: \$16.95

370

PRICE: \$16.95

371

PRICE: \$16.95

372

PRICE: \$16.95

373

PRICE: \$16.95

374

CHRISTMAS GIFTS for YOUR FAVORITE COMPUTER

TWO NEW \$100 PRODUCTS FROM WAMECO

FPB-1 FRONT PANEL BOARD

- * DIRECT PLUG IN REPLACEMENT FOR IMSAI
- * HEXADECIMAL READOUTS FOR DATA, ADDRESSES, AND PORT
- * USES LOW COST SEVEN SEGMENT DISPLAYS
- * CAN SINGLE STEP BY INSTRUCTION OR BY BYTE

\$50 BARE

FDC-1 FLOPPY DISC CONTROLLER

- * WILL CONTROL MINI OR FULL SIZE FLOPPY DISCS
- * WILL CONTROL UP TO EIGHT FLOPPIES AS CONFIGURED, WITH SIMPLE MODIFICATION WILL CONTROL UP TO 64
- * USES CPM

\$45 BARE



OTHER WAMECO INC. S-100 PRODUCTS (bare board price)

- * QMB-9 Nine Slot Mother Board \$35.
- * QMB-12 Thirteen Slot Mother Board \$40.
- * MEM-1A 8 KBYTE 2102 Ram Memory Board \$30.
- * MEM-2 16 KBYTE 2114 Ram Memory Board \$30.
- * EPM-1 4 KBYTE 1702 EPROM Board \$30.
- * EPM-2 16 or 32 KBYTE 2708/2716 EPROM Board \$30.
- * RTC-1 RealTime Clock Board \$30.
- * CPU-1 8080 CPU Board \$30.



WAMECO DEALERS AND DISTRIBUTORS:

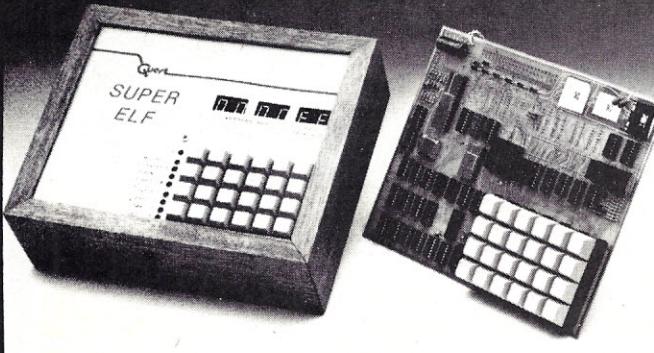
DENMARK	UNITED STATES	COLORADO	PENNSYLVANIA
Piezodan Aps. Bakkerdraget 55 3480 Fredensborg Phone 03-283744	ARIZONA * Computer Ware, Inc. 214 West Southern Tempe, 85282 Phone (602) 968-6312	Bits and Chips 718 9th Street Greeley Phone (303) 356-7554	Marketline Systems 2337 Philmont Ave. Huntington Valley Phone (215) 947-6670
ENGLAND	CALIFORNIA Adares Micro Computer Systems 239 Frances Street Bakersfield, 93308 Phone (805) 393-1326	Hobby World 5716 West Manchester #5 Los Angeles, 90045 Phone (213) 641-4200	Byte Shop of Colorado Springs Micro-Computer Products 1845 N. Circle Drive Colorado Springs, 80909 Phone (303) 633-7075
FRANCE	* Advanced Computer Products 1310 "B" East Edinger Santa Ana, 92705 Phone (714) 588-8813	Hollywood Systems 9100 Sunset Blvd. Suite 112 Hollywood, 90069 Phone (213) 271-9726	116 S. Pugh Street State College, 16801 Phone (814) 238-7711
GERMANY	Anchor Electronics 2102 Walsh Ave. Santa Clara Phone (408) 246-3696	The Computer Broker 12805 W. Standard Morrison, 80465 Phone (303) 979-6441	TEXAS Young Electronics Service P.O. Box 22 College Station, 77840 Phone (713) 693-3462
SCOTLAND	Byte Shop Computer Store 3400 El Camino Real Santa Clara Phone (408) 249-4221	Computer Technology 3400 West 64th Ave. Denver, 80221	WEST VIRGINIA The Computer Corner 22 Beechurst Ave. Morgantown, 26505 Phone (304) 292-9700
FRANCE	Suehirorocho Heim Bldg. Rm 706 5-5, 3-Chome, Kokokanda, Chiyoda-Ku Tokyo, 101 Phone (03) 255-9885	Miti Mini Computer Co. 621 S. Broadway Denver, 80209 Phones (303) 778-6230, 733-8681	
GERMANY	Byte Shop of Palo Alto 2233 El Camino Real Palo Alto, 94306 Phone (415) 327-8080	PCE Electronics 4782 Dewey Drive Fair Oaks, 95628 Phone (916) 966-7033	
SCOTLAND	Computrend Box 2541-K Anaheim, 92804 Phone (714) 533-3572	Proko Electronics San Luis Obispo, 93401 Phone (805) 544-5441	NEW JERSEY William Electronics Supply * DISTRIBUTOR 1863 Woodbridge Avenue Edison, 08817 Phone (201) 985-3700
FRANCE	D. C. I. Computer Systems 4670 N. El Capitan Fresno Phone (209) 266-9566	MICHIGAN P.S. Inc. 1625 First Avenue North Moorhead, 56560 Phone (218) 233-6682	

**Dealer Inquiries Invited!
University Discounts Available**

wmc inc.

✓W22

WAMECO Inc. 3107 LANEVIEW DRIVE, SAN JOSE, CALIF. 95132



QUEST Cosmac Super Elf Computer \$106.95

Compare features before you decide to buy any other computer. There is no other computer on the market today that has all the desirable benefits of the **Super Elf** for so little money. The Super Elf is a small single board computer that does many **big** things. It is an excellent computer for training and for learning programming with its machine language and yet it is easily **expanded** with **additional memory**, **Tiny Basic**, **Ascii Keyboards**, **video character generation**, etc.

The **Super Elf** includes a **ROM** monitor for program loading, editing and execution with **SINGLE STEP** for program debugging which is not included in others at the same price. With **SINGLE STEP** you can see the microprocessor chip operating with the unique **Quest** address and **address option \$8.95**. Low **address option \$9.95**. Custom **Hardware Cabinet** with drilled and labelled front panel **\$24.95**. **NiCad Battery Backup Kit \$4.95**. All kits and options also come completely assembled and tested.

Questdata, a 12 page monthly software publication for 1802 computer users is available by subscription for \$12.00 per year.

Tiny Basic for ANY 1802 System

Cassette \$10.00, **On ROM Monitor \$38.00**. Super Elf owners, 30% off. **Object code listing or paper tape with manual \$5.50**.

Original ELF Kit Board \$14.95.

Super Expansion Board with

This is truly an astounding value! This board has been designed to allow you to decide how you want it optioned. The **Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardware cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed** (\$12.00 value). EPROM can be used for the monitor and Tiny Basic or other purposes.

A 1K Super ROM Monitor \$19.95 is available as an on board option in 2708 EPROM which has been programmed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, video graphics driver with blinking cursor and block move capability. The Super Monitor is written with subroutines allowing users to take advantage of monitor functions

Cassette Interface \$89.95

simply by calling them up. Improvements and revisions are easily done with the monitor. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports with full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. A Godbout 814 RAM board is available for \$127.95. **Parallel I/O Ports \$9.85**, **RS 232 \$4.50**, **TTY 20 ma I/F \$1.95**, **U-100 \$4.50**. A 50 pin connector set with ribbon cable is available at \$12.50 for easy connection between the **Super Elf** and the **Super Expansion Board**.

The **Power Supply** for the **Super Expansion Board** is a 5 amp supply with + 8V ± 18V + 12V - 5V. Regulated voltages are + 5V + + 12V \$29.95. Deluxe version includes the case at \$39.95.

Auto Clock Kit \$15.95
DC clock with 4-50" displays. Uses National MA-1012 module with alarm option. Includes light dimmer, crystal timebase PC boards. Fully regulated, comp. instr. Add \$3.95 for beautiful dark gray case. Best value anywhere.

RCA Cosmac VIP Kit \$229.00
Video computer with games and graphics.

Not a Cheap Clock Kit \$14.95
Includes everything except case. 2-PC boards. 6-50" LED Displays. 5314 clock chip, transformer, all components and full instruc. Green and orange displays also avail. Same kit w/ 80" displays. Red only.

60 Hz Crystal Time Base Kit \$4.40
Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy. Kit includes: PC board, MM5369, crystal, resistors, capacitors and trimmer.

TERMS: \$5.00 min. order U.S. Funds. Calif residents add 6% tax.
BankAmericard and Master Charge accepted.
Shipping charges will be added on charge cards.

Digital Temperature Meter Kit \$39.95
Indoor and outdoor. Switches back and forth. Beautiful, 50" LED readouts. Nothing like it available. Needs no additional parts for complete, full operation. Will measure -100° to +200°F, tenths of a degree, air or liquid. Very accurate.

Beautiful hardwood case w/bezel \$11.75

NiCad Battery Fixer/Charger Kit
Opens shorted cells that won't hold a charge and then charges them up, all in one kit w/full parts and instructions.

\$7.25

PROM Eraser
Ultraviolet, assembled \$49.95

Clock Calendar Kit \$23.95
CT7015 direct drive chip displays date and time on 6" LEDS with AM-PM indicator. Alarm/doze feature includes buzzer. Complete with all parts, power supply and instructions, less case.

Same day shipment. First line parts only. Factory tested. Guaranteed money back. Quality IC's and other components at factory prices.

INTEGRATED CIRCUITS

CLOCK MODULES Complete alarm clocks ready hook up with transformer and power. Very compact with 50" and 84" digits.									
MA1002A, C or E, "S"									8.95
102P3 Transformer									2.25
MA1011, C or E, "S"									11.95
102P4 Transformer									2.25
Special transformer and six switches when purchased w/module									2.95
MA1001 car module, "3" green fluorescent									15.95

RESISTORS 1/4 watt 5%									
10 per type 1000 per type 012									12.95
25 per type 025 350 piece pack									12.95
50 per type 015 5 per type 6.75									12.95

KEYBOARDS									
56 key ASCII keyboard kit									\$62.50
53 key ASCII keyboard kit									55.00
Fully assembled 650 Enclosure 14.95									

LEDS									
Red T018									15
Green, Orange, Yellow T018									20
Jumbo Green, Orange, Yellow Jumbo									25
Clipite LED Mounting Clips 8/51.25									8/51.25

CONTINENTAL SPECIALTIES in stock									
Complete line of breadboard test equipment									
MAX 100 board, 1000 board, 1250 board									125.00
DX WIRE WIRE TOOLS in stock									18.00

PORTABLE Multimeters									
A/D 1000 digital									10.00
A/D 1000 digital									10.00

DIAL THERMOMETER									
A/D 1000 digital									10.00
A/D 1000 digital									10.00

WIRE WRAP TOOLS in stock									
DX WIRE WIRE TOOLS in stock									
Portable Multimeters									18.00

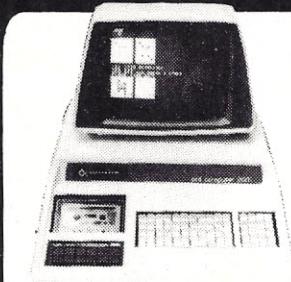
DIGITAL THERMOMETER									
A/D 1000 digital									5.50
A/D 1000 digital									5.50

COMPUTER BOARD KITS									
8K RAM Board Kit									\$134.95
4K EPROM Kit									114.95
1K Board Kit									44.50
Extended board connector									12.00
Video Interface board kit									3.75
16K EPROM board kit w/o PROMS									74.50
16K Static RAM board kit									39.00
North Star Floppy Disk Kit									12.50
Add-on board									415.00

SPECIAL PRODUCTS									
M56505 Stopwatch Timer									9.00
PC board									7.50
Switches, Mem. Pushbutton									2.25
Encoder									2.25
3 Digit Universal									1.95
Counter Board									1.95
Digital Counter									1.95
Digital Counter									1.95
Digital Counter									1.95
Digital Counter									1.95
Digital Counter									1.95
Digital Counter									1.95
Digital Counter									1.95
Digital Counter									

BUY FROM THE BIGGEST

NCE/CompuMart



PET
\$795

THE PET CONNECTION

1250 North Main Street, Department KB19
P.O. Box 8610 Ann Arbor, Michigan 48107

✓N7

Hams! Add a PET to your rig.

Computerize your station with Microtronics' M-65 Ham Interface and a PET computer. You simply plug the unit into your rig and you're ready to display, transmit and receive either CW or RTTY at rates up to 100 WPM.

ASSEMBLED KITS
\$99.95

SECOND CASSETTE FOR PET-\$99.95

This peripheral from Commodore gives you the ability to use one tape deck for input and one for output: copy files, etc.

KIM-1

The original fully expandable single board computer

Assembled

\$179

with power supply

\$209

EXPAND YOUR KIM SYSTEM:

KIM5
KIM to S-100 Board
Kit

\$125

Assembled

\$169

Connector set

\$15

KIM4
Expansion board

\$119

MICRO TECH. POWER SUPPLY

Assembled

\$34.95

KIM ENCLOSURE

Give your KIM a professional appearance. No alterations required. sturdy Kydex 100. Black

\$23.50

SELECTRIC-BASED TERMINAL FOR PET

\$895

We have interfaced the TC-71 to the PET. Use with the IEEE-488 port as a printer or with the VIA User Port for bidirectional I/O. Ideal for Word Processing applications.

Sale price if bought with PET: \$795

LOW-COST PRINTER FOR PET

This is a completely refurbished Teletype KSR-30 terminal ready to attach to your PET's interface to use as a printer.

INTRODUCTORY PRICE \$395

WE WANT TO BUY USED MICROCOMPUTERS

Any Quantity

Urgently needed:

- Peripherals
- Manufacturers surplus
- Closed stores stock



CASH AVAILABLE

Call Today: (313) 994-3200

Compucolor II

NEW!
\$225
Model 3 8K RAM \$1495
Model 4 16K RAM \$1795
Model 5 32K RAM \$2395

- Beautiful 128 x 196 color graphics
- 4K Graphics RAM
- 16K ROM RAM
- 8080 Processor
- Built-in 5 1/4" mini floppy
- RS-232 interface
- Full size keyboard
- Preprogrammed diskettes available

SALE
\$225
SANYO MONITOR
VM4209 9" quality monitor \$1495

New Acoustic Coupler

\$159

NCE/CompuMart Inc. breaks the price barrier with the new RS-232 acoustic coupler. For only \$159 you get an assembled, tested stand alone unit which accepts the standard telephone handset for full or half duplex operation. Complete with power supply and carrier detect light, the unit is housed in an attractive case for desktop use.

TC-71 SELECTRIC TERMINALS

Top-quality printing terminal with RS-232, PTTC code. Includes desk, 130 charline ASCII version employs 8802 for code conversion. See our catalog for details.

ASCII
Refurbished
Working
As-Is

\$864

\$895

\$495

\$338

SALE ASCII INTERFACE FOR TC-71

30 day delivery Normally \$199 NOW **\$169**

Acoustic Coupler for use with ASCII TC-71 **\$159**

TI PROGRAMMER
Hexadecimal, octal, decimal
calculator/convertor.
Reg. \$99.95
NOW **\$49.95**

**1-800
521
1534**

- Michigan residents add 4% sales tax.
- Foreign orders (except Canada) add 10% additional handling (U.S. currency only).
- P.O.'s accepted from D&B rated companies.
- Toll free phones open from 9:00 a.m.-7:00 p.m. EST Monday - Friday, 10:00 a.m.-5 p.m. Saturdays. • Open accounts invited

Just say charge it! Which card?



Member Computer Systems

Member Computer Systems

Member Computer Systems

THE PET CONNECTION

1250 North Main Street, Department KB19
P.O. Box 8610 Ann Arbor, Michigan 48107

✓N7

Networks Bidirectional RS-232

Interface
Single Port
Dual Port
Cabinet

\$795.00

\$280.00

\$35.00

RS-232 Printer Adapter

— assembled board

\$98.50

Networks Modem for PET

Attaches to DAA

\$320.00

Cabinet

\$35.00

PET with 8K user memory

\$795.00

Second Cassette drive

\$99.95

RS-232 Printer Adapter

— assembled board

\$98.50

With power supply, case & connector

\$169.00

Beeper — PET controlled beep

\$24.95

Video Buffer — add a conventional monitor

\$29.95

EXPANDAPET — Economical 16K memory expansion for the PET (includes 1 daughter board)

\$43.00

without daughter board

\$395.00

NEW ASCII INTERFACES for Reader/Punch

30 Day delivery on Interfaces

Boards & Cables	\$220
Parallel	\$220
RS232 Serial	\$350
Board, Cables, Power Supply	\$490
Parallel	\$490
Serial	\$615
Board, Cables, Power Supply, Enclosure	\$575
Parallel	\$575
Serial	\$780

READER/PUNCH

8 LEVEL PAPER TAPE/READER PUNCH



8 LEVEL PAPER TAPE/READER PUNCH

USED (90 day warranty) **\$175.00**

Documentation Package **\$15.00**

EXIDY SORCERER

- Z-80 Processor
- Full-size ASCII keyboard
- User definable characters
- Up to 32K on-board RAM
- Integrated ROM PACs
- 32 x 16 display
- Resident 4K Monitor ROM
- Dual Cassette I/O
- Serial and Parallel I/O
- Complete Operators Manual
- Only \$995

Top value in our catalog, simply add a monitor and tape decks to complete the system. The Sorcerer is a terminal. Later ROM PACs will be Z-80 Assembly Language, APL, PILOT, Word Processing and a DOS ROM. Z-80 based FORTRAN and COBOL. What a system for \$995.

Sorcerer RK **\$995**

Sorcerer 16K **\$150**

Sorcerer 32K **\$195**

16K Expansion **\$299**

Single board

VIDEO TERMINAL by XITEK

16 Line x 24 char display, 100 printable characters, software UART (ASCII or Baudot), 3 serial interfaces & cassette I/O, true composite video, TTL compatible, easy power connection.

Assembled & tested **NOW \$175**

SALE!

IN STOCK NOW

\$749.00

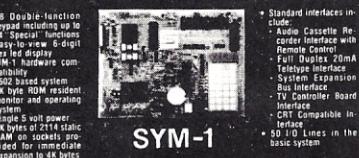
Hazeltine 1400

Now a 5th Generation in Terminals:

Introductory Sale Price — Immediate Delivery

- 24 x 80 display
- RS-232C interface
- 110 to 9600 Baud
- 12" CRT Monitor
- Remote screen control
- Uses 8048 microprocessor
- State-of-the-art design

A full capability terminal completely assembled with a 90 day warranty for less than you'd pay for a kit.



SY-1

From Synertek

\$269.00

Rockwell

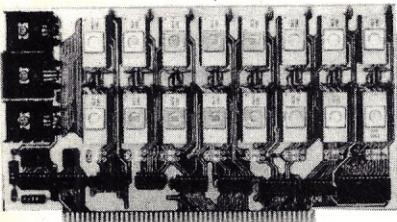
AIM65

- Fully assembled, tested, and warranted
- Addressing to 65K bytes (1K RAM on board)
- Includes onboard
 - Powerful 4K ROM Debug/Monitor
 - Sockets for additional 4K RAM 16K ROM
 - 20 char ASCII Thermal printer 190 characters
 - Full size (54 key) Alphanumeric keyboard
 - 20 char ASCII Alphanumeric display
 - Application Conn for 2 cassette ports
 - Expansion Conn. (try KIM-1 2000)
 - Both connectors totally KIM-1 compatible
 - Easy Power connections
- Options — 4K ROM Assembler/Text Editor
 - 8K Basic ROM

\$375

call for credit application. • Most items in stock for immediate shipment — call for delivery quotation. • Sorry — NO C.O.D.'s. • All prices subject to change without notice. • Write for our FREE catalog. • In the Ann Arbor area? Retail store open 11:00 a.m.-7:00 p.m. Tuesday-Friday, 10:00 a.m.-5:00 p.m. Saturdays.

16K EPROM CARD-S 100 BUSS



\$59.95
KIT

OUR
BEST
SELLING
KIT!

USES 2708's!

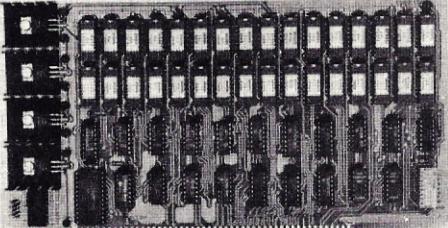
Thousands of personal and business systems around the world use this board with complete satisfaction. Puts 16K of software on line at **ALL TIMES!** Kit features a top quality soldermasked and silk-screened PC board and first run parts and sockets. All parts (except 2708's) are included. Any number of EPROM locations may be disabled to avoid any memory conflicts. Fully buffered and has WAIT STATE capabilities.

OUR 450NS 2708'S
ARE \$8.95 EA. WITH
PURCHASE OF KIT

ASSEMBLED
AND FULLY TESTED
ADD \$25

16K STATIC RAM KIT-S 100 BUSS

\$295 KIT



FULLY
STATIC, AT
DYNAMIC PRICES

WHY THE 2114 RAM CHIP?

We feel the 2114 will be the next industry standard RAM chip (like the 2102 was). This means price, availability, and quality will all be good! Next, the 2114 is **FULLY STATIC!** We feel this is the **ONLY** way to go on the S-100 Buss! We've all heard the HORROR stories about some Dynamic Ram Boards having trouble with DMA and FLOPPY DISC DRIVES. Who needs these kinds of problems? And finally, even among other 4K Static RAM's the 2114 stands out! Not all 4K static RAMs are created equal! Some of the other 4K's have **clocked** chip enable lines and various timing windows **just as critical** as Dynamic RAM's. Some of our competitor's 16K boards use these "tricky" devices. But not us! The 2114 is the **ONLY** logical choice for a trouble-free, straightforward design.

BLANK PC BOARD W/DATA—\$33

LOW PROFILE SOCKET SET—\$12

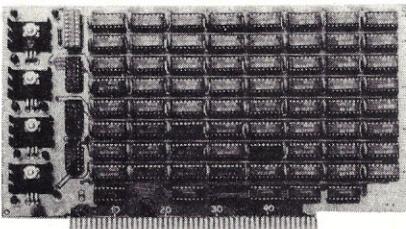
SUPPORT IC'S & CAPS—\$19.95

KIT FEATURES:

1. Addressable as four separate 4K Blocks.
2. ON BOARD BANK SELECT circuitry (Cromemco Standard!). Allows up to 512K on line!
3. Uses 2114 (450NS) 4K Static RAMs.
4. ON BOARD SELECTABLE WAIT STATES.
5. Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers.
6. All address and data lines fully buffered.
7. Kit includes ALL parts and sockets.
8. PHANTOM is jumpered to PIN 67.
9. LOW POWER: under 2 amps TYPICAL from the #8 Volt Buss.
10. Blank PC Board can be populated as any multiple of 4K.

ASSEMBLED & TESTED—ADD \$30
2114 RAM'S—8 FOR \$69.95

8K LOW POWER RAM KIT-S 100 BUSS



\$129 KIT

Use 21L02
450 NS RAMS!

Thousands of computer systems rely on this rugged, work horse, RAM board. Designed for error-free, NO HASSLE, systems use.

KIT FEATURES:

1. Doubled sided PC Board with solder mask and silk screen layout. Gold plated contact fingers.
2. All sockets included.
3. Fully buffered on all address and data lines.
4. Phantom is jumper selectable to pin 67.
5. FOUR 7805 regulators are provided on card.

Blank PC Board w/Documentation
\$29.95
Low Profile Socket Set...**13.50**
Support IC's (TTL & Regulators)
\$9.75
Bypass CAP's (Disc & Tantalums)
\$4.50

ASSEMBLED AND FULLY
BURNED IN ADD \$30

16K STATIC RAM KIT SWTPC (SS-50) 6800 BUSS

USES 2114
4K RAMS!

\$295
COMPLETE KIT

WHY PAY MORE
FOR FINNICKY
DYNAMIC BOARDS?

At last an affordable static RAM board for this popular buss. Quality PC Board with solder mask and silk-screen. Fully buffered with plenty of bypassing for reliable operation. FOUR ON-BOARD REGULATORS.

16K DYNAMIC RAM CHIP

16K X 1 Bits. 16 Pin Package. Same as Mostek 4116-4. 250 NS access, 410 NS cycle time. Our best price yet for this state of the art RAM. 32K and 64K RAM boards using this chip are readily available. These are new, fully guaranteed devices by a major mfg.

VERY LIMITED STOCK!

8 FOR \$89.95

NOT ASSOCIATED
WITH
DIGITAL RESEARCH
OF CALIFORNIA,
THE SUPPLIERS OF
CPM SOFTWARE.

2708 EPROMS

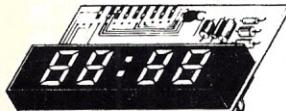
Now full speed! Prime new units from a major U.S. Mfg. 450 N.S. Access time. 1K x 8. Equiv. to 4-1702 A's in one package.

\$15.75 ea. **\$9.95**
PRICE CUT

4 FOR \$50.00

NATIONAL SEMICONDUCTOR

JUMBO CLOCK MODULE



\$6.95

2 FOR
\$13
(AC XFMR \$1.95)

ASSEMBLED! NOT A KIT!

ZULU VERSION!
We have a limited number of the 24 HR Real
time version of this module in stock
#MA100BD — \$9.95

PERFECT FOR USE
WITH A TIMEBASE.

COMPARE AT UP TO TWICE
OUR PRICE!

MANUFACTURER'S CLOSEOUT!

MA1008A
BRAND NEW!

FEATURES:
• FOUR 7SEGMENT 1/2 INCH LED DISPLAYS
• 12/24 HOUR REAL TIME FORMATTING
• 24 HR ALARM SIGNAL OUTPUT
• 50 OR 60 Hz OPERATION
• LED BRIGHTNESS CONTROL
• POWER ON LED INDICATOR
• SLEEP & SNOOZE TIMERS
• DIRECT LED DRIVE (LOW RFI)
• COMES WITH FULL DATA

WESTERN DIGITAL UART

TR1602A. PIN FOR PIN SUB FOR
AY5-1013 AND TMS6011.

FOR SERIAL I/O



\$2.99

EACH
SURPLUS SPECIAL

SALE!
1N4148 DIODES. SILICON.

Same as 1N914. New,
factory prime, Full Leads.
100 FOR \$2
1000 FOR \$17.50

New! REAL TIME
Computer Clock Chip
N.S. MM5313. Features
BOTH 7 segment and
BCD outputs. 28 Pin
DIP. \$4.95 with Data
\$4.95 with Data

Z-80 PROGRAMMING MANUAL

By MOSTEK, or ZILOG. The most detailed explanation ever on the working of the Z-80 CPU CHIPS. At least one full page on each of the 158 Z-80 instructions. A MUST reference manual for any user of the Z-80. 300 pages. Just off the press.

\$12.95

8212 I/O CHIP

8 BITS. 8080 or Z-80
SUPPORT CHIP. 24 PIN
CHIP. NEW BY N.E.C.

SPECIAL: **\$2.25** EACH

MOTOROLA 7805R VOLTAGE

REGULATOR. Same as standard 7805
except 750 MA output. TO-220. 5VDC
output.

44¢ each or 10 for \$3.95

Digital Research Corporation
(OF TEXAS)

P. O. BOX 401247K GARLAND, TEXAS 75040 • (214) 271-2461

✓D20

TERMS: Add 30¢ postage, we pay balance. Orders under \$15 add 75¢ handling. No C.O.D. We accept Visa, MasterCharge, and American Express cards. Tex. Res. add 5% Tax. Foreign orders (except Canada add 20% P & H. 90 Day Money Back Guarantee on all items.

DIODES/ZENERS				SOCKETS/BRIDGES					TRANSISTORS, LEDs, etc.			
1N914	100v	10mA	.05	8-pin	pcb	.20	ww	.35	2N2222	NPN (2N2222 Plastic .10)	.15	
1N4005	600v	1A	.08	14-pin	pcb	.20	ww	.40	2N2907	PNP	.15	
1N4007	1000v	1A	.15	16-pin	pcb	.20	ww	.40	2N3906	PNP (Plastic - Unmarked)	.10	
1N4148	75v	10mA	.05	18-pin	pcb	.25	ww	.75	2N3904	NPN (Plastic - Unmarked)	.10	
1N4733	5.1v	1 W Zener	.25	22-pin	pcb	.35	ww	.95	2N3054	NPN	.35	
1N753A	6.2v	500 mW Zener	.25	24-pin	pcb	.35	ww	.95	2N3055	NPN 15A 60v	.50	
1N758A	10v	"	.25	28-pin	pcb	.45	ww	1.25	T1P125	PNP Darlington	.95	
1N759A	12v	"	.25	40-pin	pcb	.50	ww	1.25	LED Green, Red, Clear, Yellow		.15	
1N5243	13v	"	.25	Molex pins	.01	To-3 Sockets		.25	D.L.747	7 seg 5/8" High com-anode	1.95	
1N5244B	14v	"	.25	2 Amp Bridge		100-prv		.95	MAN72	7 seg com-anode (Red)	1.25	
1N5245B	15v	"	.25	25 Amp Bridge		200-prv		1.95	MAN3610	7 seg com-anode (Orange)	1.25	
									MAN82A	7 seg com-anode (Yellow)	1.25	
									MAN74A	7 seg com-cathode (Red)	1.50	
									FND359	7 seg com-cathode (Red)	1.25	
C MOS				- T T L -								
4000	.15	7400	.10	7473	.25	74176	.85	74H72	.35	74S133	.40	
4001	.15	7401	.15	7474	.30	74180	.55	74H101	.75	74S140	.55	
4002	.20	7402	.15	7475	.35	74181	2.25	74H103	.55	74S151	.30	
4004	3.95	7403	.15	7476	.40	74182	.75	74H106	.95	74S153	.35	
4006	.95	7404	.10	7480	.55	74190	1.25			74S157	.75	
4007	.20	7405	.25	7481	.75	74191	.95	74L00	.25	74S158	.30	
4008	.75	7406	.25	7483	.75	74192	.75	74L02	.20	74S194	1.05	
4009	.35	7407	.55	7485	.55	74193	.85	74L03	.25	74S257 (8123)	1.05	
4010	.35	7408	.15	7486	.25	74194	.95	74L04	.30			
4011	.20	7409	.15	7489	1.05	74195	.95	74L10	.20	74LS00	.20	
4012	.20	7410	.15	7490	.45	74196	.95	74L20	.35	74LS01	.20	
4013	.40	7411	.25	7491	.70	74197	.95	74L30	.45	74LS02	.20	
4014	.75	7412	.25	7492	.45	74198	1.45	74L47	1.95	74LS04	.20	
4015	.75	7413	.25	7493	.35	74221	1.00	74L51	.45	74LS05	.25	
4016	.35	7414	.75	7494	.75	74367	.75	74L55	.65	74LS08	.25	
4017	.75	7416	.25	7495	.60			74L72	.45	74LS09	.25	
4018	.75	7417	.40	7496	.80	75108A	.35	74L73	.40	74LS10	.25	
4019	.35	7420	.15	74100	1.15	75491	.50	74L74	.45	74LS11	.25	
4020	.85	7426	.25	74107	.25	75492	.50	74L75	.55	74LS20	.20	
4021	.75	7427	.25	74121	.35			74L93	.55	74LS21	.25	
4022	.75	7430	.15	74122	.55			74L123	.85	74LS22	.25	
4023	.20	7432	.20	74123	.35	74H00	.15			74LS32	.25	
4024	.75	7437	.20	74125	.45	74H01	.20	74S00	.35	74LS37	.25	
4025	.20	7438	.20	74126	.35	74H04	.20	74S02	.35	74LS38	.35	
4026	1.95	7440	.20	74132	.75	74H05	.20	74S03	.25	74LS40	.30	
4027	.35	7441	1.15	74141	.90	74H08	.35	74S04	.25	74LS42	.65	
4028	.75	7442	.45	74150	.85	74H10	.35	74S05	.35	74LS51	.35	
4030	.35	7443	.45	74151	.65	74H11	.25	74S08	.35	74LS74	.35	
4033	1.50	7444	.45	74153	.75	74H15	.45	74S10	.35	74LS86	.35	
4034	2.45	7445	.65	74154	.95	74H20	.25	74S11	.35	74LS90	.55	
4035	.75	7446	.70	74156	.70	74H21	.25	74S20	.25	74LS93	.55	
4040	.75	7447	.70	74157	.65	74H22	.40	74S40	.20	74LS107	.40	
4041	.69	7448	.50	74161	.55	74H30	.20	74S50	.20	74LS123	1.00	
4042	.65	7450	.25	74163	.85	74H40	.25	74S51	.25	74LS151	.75	
4043	.50	7451	.25	74164	.60	74H50	.25	74S64	.15	74LS153	.75	
4044	.65	7453	.20	74165	1.10	74H51	.25	74S74	.35	74LS157	.75	
4046	1.25	7454	.25	74166	1.25	74H52	.15	74S112	.60	74LS164	1.00	
4049	.45	7460	.40	74175	.80	74H53J	.25	74S114	.65	74LS193	.95	
4050	.45	7470	.45			74H55	.20			74LS367	.75	
4066	.55	7472	.40							74LS368	.65	
4069/74C04	.25			MCT2	.95	LINEARS, REGULATORS, etc.						
4071	.25			8038	3.95	LM320T5	1.65	LM340K15	1.25	LM723	.40	
4081	.30			LM201	.75	LM320T12	1.65	LM340K18	1.25	LM725N	2.50	
4082	.30			LM301	.45	LM320T15	1.65	LM340K24	1.25	LM739	1.50	
MC 14409	14.50			LM308 (Mini)	.95	LM324N	1.25	78L05	.75	LM741 (8-14)	.25	
MC 14419	4.85			LM309H	.65	LM339	.75	78L12	.75	LM747	1.10	
4511	.95			LM309K (340K-5)85		7805 (340T5)	.95	78L15	.75	LM1307	1.25	
74C151	1.90			LM310	.85	LM340T12	.95	78M05	.75	LM1458	.65	
9000 SERIES				LM311D (Mini)	.75	LM340T15	.95	LM373	2.95	LM3900	.50	
9301	.85	95H03	1.10	LM318 (Mini)	1.75	LM340T18	.95	LM380 (8-14 PIN)	.95	LM75451	.65	
9309	.35	9601	.20	LM320K5(7905)1.65		LM340T24	.95	LM709 (8, 14 PIN)	.25	NE555	.35	
9322	.65	9602	.45	LM320K12	1.65	LM340K12	1.25	LM711	.45	NE556	.85	
										NE565	.95	
										NE566	1.25	
										NE567	.95	
MICRO'S, RAMS, CPU'S, E-PROMS				INTEGRATED CIRCUITS UNLIMITED					19			
74S188	3.00	8214	8.95	7889 Clairemont Mesa Boulevard, San Diego, California 92111 (714) 278-4394 (Calif. Res.)					SPECIAL DISCOUNTS			
1702A	4.50	8224	3.25	All orders shipped prepaid		No minimum			Total Order	Deduct		
MM5314	3.00	8228	6.00	Open accounts invited		COD orders accepted			\$35 - \$99	10%		
MM5316	3.50	8251	8.50	Discounts available at OEM Quantities		California Residents add 6% Sales Tax			\$100 - \$300	15%		
2102-1	1.45	8255	8.50	All IC's Prime/Guaranteed. All orders shipped same day received.					\$301 - \$1000	20%		
2102L-1	1.75	8T13	1.50									
2114	9.50	8T23	1.50									
TR1602B	3.95	8T24	2.00									
TMS 4044-	9.95	8T97	1.00									
		2107B-4	4.95									
8080	8.95	2708	9.50									
8212	2.95	Z80 PIO	8.50									
24 Hour Toll Free Phone 1-800-854-2211				American Express / BankAmericard / Visa / MasterCharge								

INTEGRATED CIRCUITS UNLIMITED

7889 Clairemont Mesa Boulevard, San Diego, California 92111

(714) 278-4394 (Calif. Res.)

All orders shipped prepaid

No minimum

Open accounts invited

COD orders accepted

Discounts available at OEM Quantities

California Residents add 6% Sales Tax

All IC's Prime/Guaranteed. All orders shipped same day received.

\$35 - \$99

10%

\$100 - \$300

15%

\$301 - \$1000

20%

ADVANCED COMPUTER PRODUCTS

NOW IN STOCK!

... and it's COLOR

"The Compucolor II"

... a personal colorgraphics system for the modern computer man

- ★ Color Graphics 13" Color CRT
- ★ Proven 8080A CPU System
- ★ 16K Extended Disk Basic
- ★ Up to 117* Key Keyboard
- ★ Up to 32K* RAM
- ★ Minidisk Drive 51.2K Bytes/Side



*option

Model 3 w/8K, 72 Key Keyboard, RS232 \$1495.00
 Model 4 w/16K, 72 Key Keyboard, RS232 \$1795.00
 Model 5 w/32K, 72 Key Keyboard, RS232 \$2395.00
 Options: 101 Key Keyboard Add \$150.00
 117 Key Keyboard Add \$225.00
 Formatted Diskettes 2/\$19.95
 Programmed Diskettes \$19.95
 Diskette Library Inc. Hangman, Othello, Math, Chess, Startrek, Blackjack, Cubic Tic Tac Toe, Finance Vol. I, Finance Vol. II, Bonds and Securities, Assembler, Text Editor, Personal Data Base.

KIM-1

**Now only
\$229.95**

Regular price
\$245.00



The KIM-1 6502 Standard Computer System now available off the shelf. Write for complete details and software package.

- ★ Power Supply Add \$59.95
- ★ Cassette Recorder Add \$44.95
- ★ Sanyo 9" Monitor Add \$169.95

SYM-1

"The Ultimate in Single Board Low-Cost Computers" In Stock

\$269.00 IN STOCK

- ★ KIM-1 Compatible
- ★ 4K ROM Monitor
- ★ 1K Bytes 2114 RAM
- ★ 65K Memory Expansion
- ★ User EPROM 2716
- ★★ Power Supply Add \$59.95
- ★★ Cassette Recorder Add \$44.95
- ★★ Sanyo 9" Monitor Add \$169.95

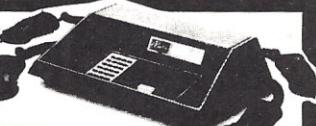
School & group discounts available.

BALLY ARCADE

Z-80 based expandable to 48K Color Display BASIC available in ROM Cartridge

\$299.95

Order Bally Cassettes @ \$19.95 ea. except 3001 @ \$24.95, 2001 Zzap & Dodgem, 2002 Sea Wolf & Missile, 2003 Attack & Red Baron, 3001 Baseball, 4001 Bingo Math & Speed Math, 4002 Letters & Crosswords, 5002 Blackjack & Poker



PRINTERS

OKIDATA Model 110 w/tractor w/RS232 \$1675.00

OKIDATA Model 22 w/tractor w/RS232 \$2705.00

DECWRITER II w/RS232 10-30 cps \$1475.00

DIABLO 1620-3 w/tractor feed, w/Keyboard \$3255.00

DIABLO 1610-3 w/tractor feed \$2995.00

IPS1 1622-3 w/tractor feed (diablo compatible) \$2995.00

IPS1 1612-3 w/tractor feed (diablo compatible) \$2820.00

Centronics 761 (KSR) \$1595.00

Centronics Micro P-1 \$395.00

Centronics 761 RO \$1495.00

Centronics 779 w/tractor feed \$1195.00

Teletype Model 43 w/RS232 \$1199.00

TI Model 745 w/upper and lower case \$1975.00

FLOPPY DISK'S

Shugart SA400 Minifloppy Disk Drive \$325.00

Shugart SA450 Dual Density Minifloppy \$375.00

Shugart SA800/801 Diskette \$495.00

Storage Drive \$625.00

Shugart SA850/851 Double-Sided Drive \$625.00

COMPUTER SPECIALS

EXIDY SORCERER™



\$895 w/8K (4-6 weeks)

\$1150 w/16K (Stock)

\$1395 w/32K (Stock)

User programmable or use cartridges. Combines the desirable features of the PET, APPLE and TRS-80 into a complete expandable computer system. If you are a comparison shopper send for comparison chart.

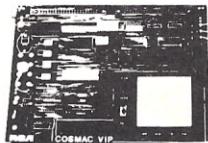
- ★ INCLUDES:
Keyboard & enclosure totally assembled
90 day Warranty
MICROSOFT BASIC
Video & Cassette Cable
Complete Documentation
- ★★ S100 Expansion Module Add \$299.00
- ★★ Cassette recorder Add \$44.95
- ★★ Sanyo 9" Monitor Add \$169.95

AIM

**NEW FROM
ROCKWELL
INTERNATIONAL**
(Avail. Oct. 15)

Singleboard Computer
★ On Board 20 column alphanumeric printer
★ Alphanumeric 20 character display
★ Terminal style Keyboard 54 Keys
★ 6502 based CPU
w/1K RAM \$375.00
w/4K RAM \$450.00
Assembler ROM ... Add \$85.00
BASIC Interpreter in ROM Add \$100.00

RCA COSMAC VIP



NEW LOW PRICE \$249.00

Assembled
Regular price \$299.95
w/Sanyo 9" Monitor Add \$169.95

"Now you can afford to experiment using RCA's fine 1802 CMOS CPU."

NORTH STAR HORIZON

Now in stock North Star Z-80 based high-performance computer.

- ★ Z-80 Processor
- ★ Motherboard
- ★ 2 Serial +1 Parallel Port
- ★ 16K RAM

Horizon I \$1439.00 Kit
Horizon II \$1799.00 Kit



Sanyo 9" Monitor \$159.95
Sanyo 15" Monitor \$209.95
Motorola 12" Monitor w/o chassis \$219.95

Hazeltine 1500 \$1095.00
Hazeltine 1510 \$1295.00

KEYBOARDS

- GEO Risk Model 756 ASCII 56 Key Assembled \$67.95
- Metal case for Model 756 \$27.00
- Clare Pender 62 Key ASCII w/26 Pin and 34 Pin Connector (new surplus supply limited) \$54.95
- 63 Key Unencoded Keyboard \$32.95
- 10 Key Hexpad Unencoded \$11.95

TERMINALS

- SOROC IQ 120 \$895.00
- LEAR ADM3 Assembled \$829.95
- LEAR ADM3 Kit \$739.95
- SOROC IQ 140 \$1495.00

ADVANCED COMPUTER PRODUCTS

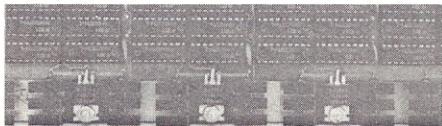
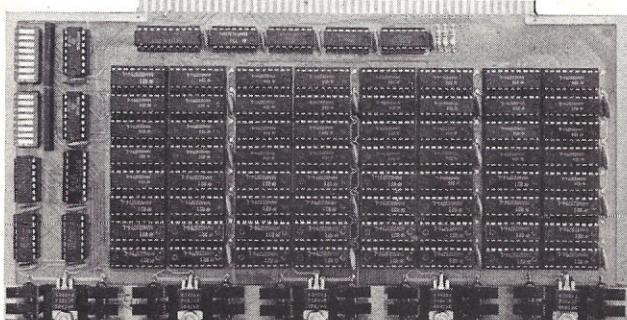
P. O. Box 17329 • Irvine, California 92713
1310 B E. Edinger • Santa Ana, California 92705
TWX/TELEX 910 595 1565 • TEL (714) 558-8813

All prices FOB Santa Ana. Please add shipping/handling. For credit card purchase contact for quotation. Complete FREE 1978 Catalogue - send 25¢ for postage. Pricing subject to change without notice.

the ECONORAM™ family from CompuKit™

Hours of trouble-free operation in thousands of systems have earned an enviable reputation for the Econoram name . . . while proving that reliable, full feature memory doesn't have to be expensive to be good. All boards are static, low power/high speed, fully buffered, and use only the best mechanical parts and electronic components; we back them up with a 1 year limited warranty to prove our point.

These boards are available as **unkits** (sockets, bypass caps pre-soldered in place for easy assembly); **assembled and tested**; or qualified under the **Certified System Component (CSC)** program (200 hour burn-in, guaranteed 4 MHz operation over the full commercial temperature range, serial numbered, and immediate replacement in event of failure within 1 year of invoice date). You don't have to spend a lot of money for good memory . . . you just have to spend it in the right place.



NEW! 32K X 8 ECONORAM X™

(\$599 unkit, \$649 assm, \$789 CSC).

Static storage for the S-100 buss. Guaranteed 4 MHz operation. Configured as two 8K and one 16K block, all independently addressable. Suitable for use in phantom systems. Extra select/deselect qualifiers for systems using more than 64K of memory make this board the ideal building block for large memory systems. Maybe you can't believe the price, but you can believe the performance.

NEW! 32K X 8 ECONORAM IX™

(\$650, unkit). Static storage for the Digital Group buss.

Now, you can add Econoram quality to your Digital Group machine.

NEW! 32K X 8 ECONORAM XI™ (\$1050, CSC only).

Static storage for SBC systems (Intel/National 80/10 and 80/20 machines). Competitive in price with dynamics, but with Econoram reliability.

WE HAVE OTHER ECONORAMS, TOO . . .

Name	Storage	Design	Buss	Configured as	Unkit	Assm	CSC
Econoram II™	8K X 8	static	S-100	dual 4K	\$139	\$159	N/A
Econoram IV™	16K X 8	static	S-100	single 16K	\$279	\$314	\$414
Econoram VI™	12K X 8	static	H8	8K + 4K	\$200	\$270	N/A
Econoram VII™	24K X 8	static	S-100	2 - 4K, 2 - 8K	\$445	\$485	\$605

SEE ECONORAM AT YOUR LOCAL COMPUTER STORE.

NEW! PET to S-100 INTERFACE BOARD!!

From HUH Electronics (designed by Mark Garetz). Interface board mates S-100 cards to the popular PET computer; also can serve as nucleus of a stand-alone 6500 series system. It's new, it's well-designed, it works, and it's only \$199.95!

TRS-80 CONVERSION KIT

Please note that our kit is guaranteed for 1 year, comes complete with DIP shunts, and uses 250 ns access time chips for operation at 4 MHz. Upgrades 4K TRS-80 to 16K, or populates Memory Expansion Module; our novice level instructions show you how. Also expands memory in APPLE computers.

\$109, or 3/\$320.

ACTIVE TERMINATOR

KIT: \$29.50

Our much-imitated design plugs into any S-100 motherboard slot to treat the S-100 buss as the RF system it really is, thereby reducing noise, glitches, ringing, overshoot, and other buss-related problems. Improves reliability, and saves power compared to passive termination.

COMPONENTS

LM317 adjustable regulator. Ltd qty; \$2.25 each.
 #CK-1001 S100 wire wrap edge connector. 3 level gold plate.
 \$5 ea, 5/\$22.
 #CK-1002 S100 solder tail edge connector. IMSAI 0.25" spacing. \$5 ea, 5/\$22.
 #CK-1003 S100 solder tail edge connector. Altair 0.14" spacing. \$6. ea, 5/\$27.50.
 #CK-1004 DB25P male 25 pin submini D type RS232 connector, \$3.95.
 #CK-1005 DB25S female 25 pin submini D type RS232 connector, \$4.90.
 #CK-1006 DB25H hood for DB25P, \$0.90.

11 SLOT S-100 MOTHERBOARD

UNKIT: \$90

Includes all 11 edge connectors soldered in place for simplified assembly. Includes active termination for reliable data transfer with energy efficiency. Dimensions: 8 1/2" x 11".

18 SLOT S-100 MOTHERBOARD

UNKIT: \$124

Same as above, but 18 slot version. Dimensions: 8.5" x 16.7".

FREE FLYER: We stock much more than we could ever fit into any one ad, but we did manage to fit it all within the 40 pages of our flyer. Send us your address, and the flyer is yours. Add 41¢ in stamps for 1st class delivery.

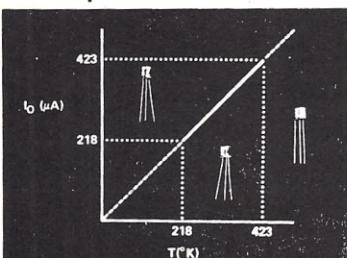
GODBOU
 BILL GODBOU ELECTRONICS
 BOX 2355, OAKLAND AIRPORT, CA 94614

TERMS: Allow 5% shipping, excess refunded. Add \$1 orders under \$15. Cal res add tax. VISA®/Mastercharge® (\$15 min) call our 24 hr. answering service at (415) 562-0636. COD OK with street address for UPS (85¢ COD charge applies).

✓ G4



Two-Terminal IC Temperature Transducer



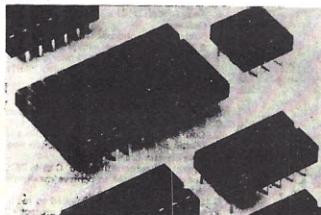
Two terminal I.C. Temperature Transducer
ANALOG DEVICES AD590J is a two terminal device producing an output current proportional to absolute temperature. Laser trimming produces $\pm 9^\circ\text{C}$ maximum error without external calibration. Calibration can reduce maximum error to only $\pm 2^\circ\text{C}$ over -55°C to $+150^\circ\text{C}$ range. Sensitivity is $1\text{uA}/^\circ\text{K}$. Use with $+4$ to $+30\text{V}$ supply as input to digital meter in thermometer applications. Excellent for remote applications due to the very high impedance. Comes in TO-52 metal can.

AD590J.....\$3.49
Specs and Application sheets.....\$0.80

MC1413P (ULN2003A) Hex Darlington\$1.59
THM-6073B TO-220 Heat Sink\$5/1.00
MC1441P Baud Rate generator\$11.98
1.843 Crystal for MC1441\$4.95
MM57109 Number Cruncher\$18.95
H1175 Opto-Fet Linear Isolator\$1.95
CA3130E Bi MOS OP Amp\$1.27
CA3140E Bi MOS OP Amp\$.50
40673 Popular dual gate FET\$1.01
MM5865N Universal Timer I.C.\$9.75
CSC 500 MHz prescaler\$59.95
B and K 2800 3/2 Digit DVM\$99.95
B and K Dual Tracer Scope Model 1432\$750.00
(FOB Phoenix)

Texas Instruments

Texas Instruments 8400-02 series, the most popular lo-profile socket ever. Double edge grip for reliability. Anti-wick wafer lets you solder without worrying about wicking, even up side down!



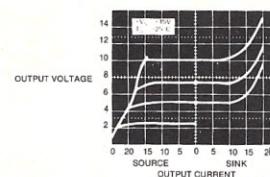
Low Profile DIP Solder Tail (Tin). End/side stackable on .1" centers!

	1-24	25-99	100-999	1000-Up
SKT-0802	8 pin	.15	.14	.12
SKT-1402	14 pin	.18	.18	.15
SKT-1602	16 pin	.20	.19	.17
SKT-1802	18 pin	.26	.25	.24
SKT-2002	20 pin	.32	.31	.29
SKT-2202	22 pin	.35	.34	.33
SKT-2402	24 pin	.35	.34	.33
SKT-2802	28 pin	.43	.42	.41
SKT-4002	40 pin	.59	.57	.55
				.430

MK5102 (N)-5 Touch Tone Receiver I.C.\$34.95
600ohm to 600ohm C.T. Xfmr\$1.95
3.579545 Color Burst Xtal\$1.75
uDP416 16K Dynamic RAM (200nS)8/ \$144.00
uDP416 16K Dynamic RAM (300nS)8/ \$128.00
6502 uProcessor\$10.95

TRI-TEK
7808 North 27th Avenue
Phoenix, Arizona 85021
(602) 995-9352
Charge card telephone orders (\$20 min.) will be accepted 9-5:30 P.M. except weekends.
Telephone (602) 995-9352. No collect calls please.

ANALOG DEVICES Pin Programmable Precision Voltage Reference



AD584 Output Voltage vs. Sink and Source Current

Pin Programmable Precision Voltage Reference
ANALOG DEVICES AD584JH offers pin-programmable selection of four popular output voltages: 10.000V, 7.500V, 5.000V and 2.500V. Laser trimming results in the most flexible monolithic precision reference available. Strobe input allows unit to "turn off" for use in power supply control. Output can sink or source current to greater than 10mA! Maximum error over full temp range (0-70°C) is $\pm 30\text{mV}$. Perfect for use in A-D converters, power supplies, calibrators, etc. 8 pin TO-5 metal can package.

AD584JH.....\$6.95
Specs and Data Sheets.....\$0.60

78P055C 5V 10A TO-3 Reg\$12.95
21L02-4 (MM2102AN-4L 450nS)\$1.44
Z80CPU I.C.\$20.00
Z80ACPU I.C.\$28.00
Z80CTC I.C.\$11.00
Z80ACTC I.C.\$16.00
Z80PIO I.C.\$11.00
Z80APIO I.C.\$16.00
25 Pin RS-232 connector Male\$2.25
25 Pin RS-232 connector Female\$3.35
DB-51226 Hood for RS-232 connector\$1.39
D-20418 Screw Lock assembly\$1.19
4801 4KX1 Static RAM\$8.95/8/ \$60.00
4804 1KX4 Static RAM\$8.95/8/ \$60.00

MICRO PROCESSOR COMPATIBLE A/D CONVERTERS

National Semi ADC3511 and 3711 are CMOS monolithic A/D converters. Pulse modulation analog-to-digital conversion is used and requires no external precision components except the reference voltage.

Single 5 volt operation. Operation with an isolated supply allows conversion of either polarity. Sign is automatically determined and indicated on the sign pin.

The ADC3511 and 3711 have been designed to provide address BCD data and are intended for use with micro processors and other digital systems. BCD digits are selected on demand via 2 Digit Select inputs. Digit Select inputs are latched. Start conversion input and conversion complete output are included on both types.

FEATURES

- .Single 5V Supply
- .ADC3511 3 1/2 digits (0 to ± 1999 counts)
- .ADC3711 3 3/4 digits (0 to ± 3999 counts)
- .Addressed BCD Outputs
- .Easily interfaced to micro processor
- .TTL compatible

ADC-3511 (3-1/2 digit)\$12.95
ADC-3711 (3-3/4 digit)\$14.95
Specs for both parts.....\$0.80

POWER OP AMP

250mA output current capability. Operates on as low as 3V. Input parameters are programmable for system optimizing. Electronic shut down allows output to float. Packaged in 8 pin mini-dip.

LM13080N\$1.94
Specs and applications.....\$0.60



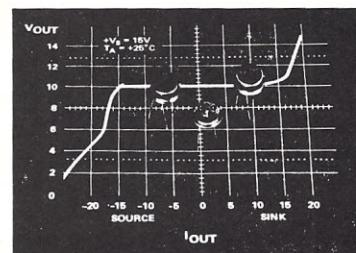
TRI-TEK

- For premium shipping (first class, special handling, etc.) add extra. Excess will be refunded.
- Please give street address for UPS shipping when possible.
- C.O.D. NO parcel post C.O.D.
- UPS C.O.D. Add 85¢ to order.
- Any correspondence not connected with your order, please send to: TRI-TEK, P.O. Box 1000, Phoenix, Arizona 85021. Please include SASE for F.A.R.E.
- Claims for shortage or damaged material must be made within 10 days of receipt of package.
- Prices are subject to change without notice.
- Any refunds will be by check, not credit vouchers.
- If we should be temporarily out of stock on any item, it will be placed on back order. If we cannot ship in 30 days, you will be notified of the expected shipping date and given the option of canceling the order or sending a money order or credit card with which to cancel your order if desired.
- Terms: Check, money order, credit card. Net 30 days to rated firms, schools and government agencies.
- Claims for defective material must be made within 60 days of receipt of parcel. Claim must include invoice number, date & defective parts.

(U.S. DOLLARS ONLY)



High Precision 10 Volt IC Reference



High Precision 10 Volt IC Reference

ANALOG DEVICES AD581J is monolithic I.C. which produces a precise 10V ($\pm 13.5\text{mV}$) with 12 to 40V input. Ideal for many A-D converter applications as well as calibrators, power supplies, etc. 3 terminal package is as easy to use as an ordinary regulator. Can be used as precision current source, can be buffered for very large current outputs. Use as 2 terminal device produces a precision zener.

AD581J (3 terminal TO-5)\$4.98
Specs and Application sheets.....\$0.60

Jumper Kits for .025 Square Posts.
All material for making jumpers for quick circuit changes and prototyping. Use for breadboarding, trouble shooting, field modifications. Fits standard IC socket wire-wrap posts. Excellent wiping action on gold plated box contacts. Kit contain 10 box contacts, heat shrinkable sleeving, and 5 feet of wire plus instruction sheet.

JCK-5101....(5 double jumpers)\$2.75, 4 kits/\$10.00

CHARACTERISTICS

GOLD



EDGEBOARD CONNECTORS

Texas Instruments, world leader in metallurgical technology, is introducing its new improved H43 connector and TRI-TEK is proud to offer it for the first time to our customers. The H43 represents the best value in the industry on this popular connector style.

Pin grid is designed to fit most of the S-100 bus machines such as Imsai, Vector, Cromemco. Will not fit Altair mother boards.

Heavy gold inlay gives you up to seven times the gold in the critical contact area at reduced cost. T.I. has the technology and TRI-TEK has T.I. Solder tail H435121-50 \$3.59 10/\$32.00
Wire wrap H435111-50 \$3.59 10/\$32.00

Quantity pricing available

ARIZONAN'S ADD 5% TAX

Shipping and Handling
U.S. and CANADA ADD 5%
Other countries add 15%

(MINIMUM ORDER U.S. \$10.00)
(FOREIGN \$15.00)

Jameco *New* **Kits**
Regulated Power Supply



- Uses LM 309K
- Heat sink provided
- P.C. board construction
- Provides a solid 1 amp @ 5V
- Includes components, hardware and instructions
- Sizes: 3-1/2" x 5" x 2" high

JE200 **\$14.95**

Function Generator Kit



- Provides 3 basic waveforms: sine, triangle & square wave
- Frequency range from 1 Hz to 100K Hz
- Output amplitude from 0-volts to over 6 volts (peak to peak)
- Uses a 12V supply or a ± 6V split supply
- Includes chip, P.C. board, components and instructions.

JE2206B **\$19.95**

Digital Stopwatch Kit



- Use Intersil 7205 Chip
- Plated thru double-sided P.C. Board
- LED display (red)
- Times to 59 min. 59.99 sec. with auto reset
- Quartz crystal controlled
- Three stopwatches in one: single event, split (cumulative) and taylor (sequential timing)
- Uses 3 penlite batteries
- Size: 4.5" x 2.15" x .90"

JE900 **\$39.95**

4-Digit Clock Kit



- Bright .357" ht. red display
- Sequential flashing colon
- 12 or 24 hour operation
- Extruded aluminum case (black)
- Pressure switches for hours, minutes and hold modes
- Includes all components, case and wall transformer
- Size: 3-1/4" x 1-3/4" x 1-1/4"

JE730 **\$14.95**



6-Digit Clock Kit

- Bright .300 ht. common cathode display
- Uses MM5314 clock chip
- Switches for hours, minutes and hold functions
- Hours easily viewable to 20 feet
- Simulated walnut case
- 115 VAC operation
- 12 or 24 hour operation
- Includes all components, case and wall transformer
- Size: 6-3/4" x 3-1/8" x 1-3/4"

JE701 **\$19.95**



Jumbo 6-Digit Clock Kit

- Four .630" ht. and two .300" ht. common anode displays
- Uses MM5314 clock chip
- Switches for hours, minutes and hold functions
- Hours easily viewable to 30 feet
- Simulated walnut case
- 115 VAC operation
- 12 or 24 hour operation
- Includes all components, case and wall transformer
- Size: 6-3/4" x 3-1/8" x 1-3/4"

JE747 **\$29.95**

MICROPROCESSOR COMPONENTS

6809A/6808A SUPPORT DEVICES		MICROPROCESSOR MANUALS	
8090A	CPU	\$ 9.95	M-280 User Manual
	8-Bit Input/Output	3.25	M-COP1802 User Manual
8214	Priority Interrupt Control	5.95	M-2650 User Manual
8216	Bi-Directional Bus Driver	3.49	
8225	Clock Generator/Driver	3.95	
8226	Bus Driver	3.49	
8228	System Controller/Bus Driver	5.95	2513(2140) Character Generator(upper case)
8229	System Controller	5.95	2513(3021) Character Generator(lower case)
8251	Prog. Comm. 1/0 (USART)	7.95	Character Generator
8253	Prog. Interval Timer	14.95	10.95
8255	Prog. Periph. 1/0 (PPI)	9.95	1.95
8257	Prog. DMA Control	19.95	
8259	Prog. Interrupt Control	19.95	
6800/6809 SUPPORT DEVICES		ROM'S	
MC6800	MPU	\$14.95	1101 256X1 Static \$1.49
MC6802CP	MPU with Clock and Ram	12.95	1103 1024X1 Dynamic .99
MC6804P	MC6804P	12.95	2101(8101) 256X4 Static 3.95
MC6821	Priority Interrupt Controller	7.95	2102 1024X1 Static 1.75
MC6824	Programmable I/O (MC6820)	7.49	2114 128X1 Static 1.75
MC6828	2400 bps Modulator	12.95	258X4 Static MOS 4.95
MC6830LB	1024K Bit ROM (MC68A30-8)	14.95	2114 1024X1 Static 4.95
MC6850	Asynchronous Comm. Adapter	7.95	2114-3 300X1 Static 10.95
MC6852	Synchronous Serial Data Adapter.	9.95	2114-3 1024X1 Static 10.95
MC6860	2400 bps Digital MODEM	12.95	5101 256X4 Static 7.95
MC6862	2400 bps Modulator	14.95	5280/2107 1024X1 Dynamic 4.95
MC6880A	Quad 3-State Bus. Trans. (MC8126)	2.25	7489 16X4 Static 1.75
MICROPROCESSOR CHIPS-MISCELLANEOUS		RAM'S	
Z80(780C)	CPU	\$19.95	74200 256X1 Static Tristate 4.95
Z80(180-1)	CPU	24.95	256X1 Static 2.95
COP180	CPU	19.95	4K Dynamic 16 pin 4.95
2550	MPU	19.95	16K Dynamic 16 pin 14.95
8035	8-Bit MPU w/clock, RAM, 1/0 lines	19.95	45N 1024X4 Static 14.95
74LS900JL	16-Bit MPU w/hardware, multiply & divide	49.95	2117 16,384X1 Dynamic 9.95
SHIFT REGISTERS		MM5262	
MM500H	Dual 25 Bit Dynamic	\$.50	2X11 (house marked) 4/1.00
MM503H	Dual 50 Bit Dynamic	\$.50	
MM504H	Dual 16 Bit Static	\$.50	
MM505H	Dual 100 Bit Static	\$.50	
MM506H	Dual 164 Bit Accumulator	\$.50	
MM507H	500/512 Bit Dynamic	\$.50	
2550T	1024 Dynamic	3.95	
2518	Hex 32 Bit Static	4.95	
2522	Dual 132 Bit Static	2.95	
2524	512 Static	2.95	
2525	1024 Dynamic	2.95	
2527	Dual 256 Bit Static	2.95	
2528	Dual 250 Static	4.00	
2529	Dual 240 Bit Static	4.00	
2532	Dual 16 Bit Static	2.95	
2533	1024 Static	6.95	
3341	Fifo	2.95	
74LS670	4X4 Register File (TriState)	1.95	
UART'S		TMS4045	
		5203 2048 FAMOS 14.95	
		1702A 2048 FAMOS 14.95	
		2176(2114) 16K* EPROM(2176) 49.95	
		TM52516 16K* EPROM(2176) 49.95	
		TM52532 4KX8 EPROM 8.95	
		TM52532 32K EPROM 10.95	
		2523 32X8 Open Collector 3.95	
		2525 25115 Bipolar 19.95	
		2525 32X8 Tri-state 3.95	
		74168 512 TTL Open Collector 9.95	
		74168 256 TTL Open Collector 9.95	
		74168 1024 Static 4.95	
A-Y-5-1013 30K BAUD		TMS4045	
		5.95 745287	
PROM'S		POWERACE	
MM500H	Dual 25 Bit Dynamic	\$.50	
MM503H	Dual 50 Bit Dynamic	\$.50	
MM504H	Dual 16 Bit Static	\$.50	
MM505H	Dual 100 Bit Static	\$.50	
MM506H	Dual 164 Bit Accumulator	\$.50	
MM507H	500/512 Bit Dynamic	\$.50	
2550T	1024 Dynamic	3.95	
2518	Hex 32 Bit Static	4.95	
2522	Dual 132 Bit Static	2.95	
2524	512 Static	2.95	
2525	1024 Dynamic	2.95	
2527	Dual 256 Bit Static	2.95	
2528	Dual 250 Static	4.00	
2529	Dual 240 Bit Static	4.00	
2532	Dual 16 Bit Static	2.95	
2533	1024 Static	6.95	
3341	Fifo	2.95	
74LS670	4X4 Register File (TriState)	1.95	
UART'S		MAX-100	
		100 MHZ 8-Digit Counter 134.95	
		20 Hz-100 MHz Range	
		6" LED Display	
		Auto-Accuracy	
		± 0.1 1mV 0.1 ohm resolution	
		Overrange reading	
		10 meg input impedance	
		DC Accuracy 1% typical	
		Ranges: DC Voltage -0-1000V	
		Freq. Response 50-400 Hz	
		DC/AC Current 0-100mA	
		Resistance 0-10 meg ohm	
		Size: 6" x 4" x 2"	
Accessories:		ACCESORIES FOR MAX 100:	
AC Adapter BC-28	\$9.00	Mobile Charger Eliminator	
Rechargeable Batteries BP-26	20.00	use power from car battery	
Carrying Case LC-28	7.50	Model 100 — CLA \$3.95	
		Charger/Eliminator	
		use 110 V AC	
		Model 100 — CAI \$9.95	
Model 2800 \$99.95		MAX-100 \$134.95	
AC Adapter BC-28	\$9.00	100 MHZ 8-Digit Counter	
Rechargeable Batteries BP-26	20.00	20 Hz-100 MHz Range	
Carrying Case LC-28	7.50	6" LED Display	
		Crystal-controlled timebase	
		Four power sources, i.e. batteries, 110 or 220V with charger 12V with auto light adapter and external 7.2-10V power supply	
		MAX-100 \$134.95	
Model 2800 \$99.95		ACCESSORIES FOR MAX 100:	
AC Adapter BC-28	\$9.00	Mobile Charger Eliminator	
Rechargeable Batteries BP-26	20.00	use power from car battery	
Carrying Case LC-28	7.50	Model 100 — CLA \$3.95	
		Charger/Eliminator	
		use 110 V AC	
		Model 100 — CAI \$9.95	
Jameco		MINI-MAX \$89.95	
MAIL ORDER ELECTRONICS — WORLDWIDE		Part No.	
1021 HOWARD AVENUE, SAN CARLOS, CA 94070		Description	
Advertised Prices Good Thru January		Price	
\$5.00 Minimum Order — U.S. Funds Only			
California Residents — Add 6% Sales Tax			
Spec Sheets — 25¢			
1979 Catalog Available — Send 41¢ stamp			
PHONE ORDERS			
WELCOME			
(415) 592-8097			
140			
The Incredible			
"Pennywhistle 103"			
\$139.95 Kit Only			
The Pennywhistle 103 is capable of recording data to and from audio tape without			
another modern terminal and terminal for telephone "hamming" and communications. In			
addition, it's free of critical adjustments and is built with non-precision, readily available parts.			
Data Transmission Method Frequency Shift Keying, full-duplex (half-duplex selectable).			
Maximum Data Rate 300 Baud.			
Data Format Asynchronous Serial (return to mark level required between each character).			
Receive Channel Frequencies 2025 Hz for space; 2225 Hz for mark.			
Transmit Channel Frequencies 2025 Hz for space; 2225 Hz for mark.			
Receive Sensitivity -46 db acoustically coupled.			
Transmit Level -15 dbm nominal. Adjustable from -6 dbm to +20 dbm.			
Receive Frequency Tolerance Frequency reference automatically adjusts to allow for operation between 1800 Hz and 2400 Hz.			
Digital Data Interface EIA RS-232C or 20 mA current loop (receiver is optoisolated and non-polar).			
Power Requirements 120 VAC, single phase, 10 Watts.			
Physical All components mount on a single 5" by 9" printed circuit board. All components included.			
Requires a VOM, Audio Oscillator, Frequency Counter or Oscilloscope to align.			
TRS-80 16K Conversion Kit			
Expand your 4K TRS-80 System to 16K. Kit comes complete with:			
* 8 each UPD416 (16K Dynamic Rams)			
* Documentation for conversion			
TRS-16K \$115.00			
Special Offer - Order both your TRS-16K and the Sup'R' MOD II Interface kit together (retail value \$144.95) for only \$139.95			
COMPUTER CASSETTES			
* 6 EACH 15 MINUTE HIGH QUALITY C-15 CASSETTES			
* PLASTIC CASE INCLUDED			
* 12 CASSETTE CAPACITY			
* ADDITIONAL CASSETTES AVAILABLE #C-15-\$2.50 ea			
CAS-6 \$14.95			
(Case and 6 Cassettes)			
SUP 'R' MOD II			
UHF Channel 33 TV Interface Unit Kit			
Wide Band B/W or Color System			
* Converts TV to Video Display for home computers, CCTV camera, Apple II, works with Cromex Dazzler, SOL-20, IRS-80, Challenger, etc.			
* MOD II is pretuned to Channel 33 (UHF).			
* Includes coaxial cable and antenna transformer.			
MOD II \$29.95 Kit			
Custom Cables & Jumpers			
DB 25 Series Cables			
DB25P-4-P	4 Ft.	2-2P25P	\$15.95 ea.
DB25P-4-S	4 Ft.	1-1P25P	\$16.95 ea.
DB25S-4	4 Ft.	2-2P25S	\$17.95 ea.
Dip Jumpers			
DJ14-1	1 ft.	1-14 Pin	\$1.59 ea.
DJ16-1	1 ft.	1-16 Pin	1.79 ea.

7400 TTL



SN7400N	.16	SN7410N	.29
SN7401N	.18	SN7413N	.35
SN7402N	.18	SN7414N	.35
SN7403N	.18	SN7416N	1.95
SN7404N	.18	SN7417N	5.00
SN7405N	.20	SN7418N	.89
SN7406N	.20	SN7419N	.50
SN7407N	.20	SN7419N	.95
SN7408N	.20	SN7419N	.95
SN7409N	.20	SN7419N	.95
SN7410N	.18	SN7419N	1.75
SN7411N	.25	SN7419N	.45
SN7412N	.25	SN7419N	.59
SN7413N	.40	SN7419N	.43
SN7414N	.70	SN7419N	.79
SN7415N	.25	SN7419N	.43
SN7416N	.25	SN7419N	.65
SN7417N	.25	SN7419N	.65
SN7420N	.20	SN7419N	.65
SN7421N	.29	SN7419N	.70
SN7422N	.39	SN7419N	.89
SN7423N	.25	SN7419N	.75
SN7425N	.29	SN7419N	.59
SN7426N	.29	SN7419N	1.95
SN7427N	.25	SN7419N	.35
SN7429N	.39	SN7419N	.25
SN7430N	.25	SN7419N	.25
SN7431N	.25	SN7419N	.25
SN7432N	.25	SN7419N	.75
SN7433N	.25	SN7419N	.69
SN7439N	.25	SN7419N	.75
SN7440N	.20	SN7419N	.79
SN7441N	.89	SN7419N	.89
SN7442N	.49	SN7419N	.25
SN7443N	.75	SN7419N	.25
SN7444N	.75	SN7419N	.19
SN7445N	.75	SN7419N	.79
SN7446N	.75	SN7419N	.19
SN7448N	.69	SN7419N	.19
SN7447N	.59	SN7419N	.89
SN7448N	.79	SN7419N	.59
SN7449N	.79	SN7419N	.59
SN7450N	.20	SN7419N	.59
SN7451N	.20	SN7419N	.59
SN7453N	.20	SN7419N	.99
SN7454N	.20	SN7419N	.79
SN7459N	.25	SN7419N	.79
SN7460N	.20	SN7419N	.65

20% Discount 100 pcs combined order 25% - 1000 pcs combined order

C/MOS

CD4000	.23	CD4070	.23
CD4002	.23	CD4028	.89
CD4006	1.19	CD4029	1.19
CD4007	.25	CD4030	.49
CD4009	.49	CD4082	.23
CD4010	.49	CD4040	1.19
CD4011	.23	CD4041	.25
CD4012	.25	CD4042	.99
CD4013	.39	CD4043	.89
CD4014	.139	CD4044	.89
CD4015	.119	CD4046	1.79
CD4016	.49	CD4047	2.50
CD4017	.119	CD4048	1.35
CD4018	.99	CD4049	.49
CD4019	.49	CD4050	.49
CD4020	.119	CD4061	.19
CD4021	.139	CD4063	1.19
CD4022	.119	CD4056	.25
CD4023	.23	CD4059	.99
CD4024	.79	CD4060	1.49
CD4025	.23	CD4066	.79
CD4026	.25	CD4068	.39
CD4027	.69	CD4069	.45

74C00

74C00	.39	74C05	2.49
74C04	.39	74C09	1.95
74C08	.49	74C19	2.49
74C10	.39	74C93	1.95
74C14	.95	74C95	2.49
74C20	.39	74C107	1.25
74C30	.39	74C108	2.50
74C42	1.95	74C154	3.00
74C48	.24	74C157	2.15
74C73	.89	74C160	2.49
74C74	.89	74C161	2.49

74C00

74C00	.39	74C163	2.49
74C02	.39	74C164	2.49
74C04	.39	74C173	2.49
74C08	.49	74C192	2.49
74C10	.39	74C193	2.49
74C14	.95	74C195	2.49
74C20	.39	74C197	2.49
74C30	.39	74C203	2.49
74C42	1.95	74C205	3.00
74C48	.24	74C217	2.15
74C73	.89	74C219	2.49
74C74	.89	74C220	2.49

74C00

74C00	.39	74C221	2.49
74C02	.39	74C222	2.49
74C04	.39	74C223	2.49
74C08	.49	74C224	2.49
74C10	.39	74C225	2.49
74C14	.95	74C227	2.49
74C20	.39	74C228	2.49
74C30	.39	74C229	2.49
74C42	1.95	74C230	2.49
74C48	.24	74C231	2.15
74C73	.89	74C232	2.49
74C74	.89	74C233	2.49

74C00

74C00	.39	74C234	2.49
74C02	.39	74C235	2.49
74C04	.39	74C236	2.49
74C08	.49	74C237	2.49
74C10	.39	74C238	2.49
74C14	.95	74C239	2.49
74C20	.39	74C240	2.49
74C30	.39	74C241	2.49
74C42	1.95	74C242	2.49
74C48	.24	74C243	2.15
74C73	.89	74C244	2.49
74C74	.89	74C245	2.49

74C00

74C00	.39	74C246	2.49
74C02	.39	74C247	2.49
74C04	.39	74C248	2.49
74C08	.49	74C249	2.49
74C10	.39	74C250	2.49
74C14	.95	74C251	2.49
74C20	.39	74C252	2.49
74C30	.39	74C253	2.49
74C42	1.95	74C254	2.49
74C48	.24	74C255	2.15
74C73	.89	74C256	2.49
74C74	.89	74C257	2.49

74C00

74C00	.39	74C258	2.49
74C02	.39	74C259	2.49
74C04	.39	74C260	2.49
74C08	.49	74C261	2.49
74C10	.39	74C262	2.49
74C14	.95	74C263	2.49
74C20	.39	74C264	2.49
74C30	.39	74C265	2.49
74C42	1.95	74C266	2.49
74C48	.24	74C267	2.15
74C73	.89	74C268	2.49
74C74	.89	74C269	2.49

74C00

74C00	.39	74C270	2.49
74C02	.39	74C271	2.49
74C04	.39	74C272	2.49
74C08	.49	74C273	2.49
74C10	.39	74C274	2.49
74C14	.95	74C275	2.49
74C20	.39	74C276	2.49
74C30	.39	74C277	2.49
74C42	1.95	74C278	2.49
74C48	.24	74C279	2.15
74C73	.89	74C280	2.49
74C74	.89	74C281	2.49

74C00

74C00	.39	74C282	2.49
74C02	.39	74C283	2.49
74C04	.39	74C284	2.49
74C08	.49	74C285	2.49
74C10	.39	74C286	2.49
74C14	.95	74C287	2.49
74C20	.39	74C288	2.49
74C30	.39	74C289	2.49
74C42	1.95	74C290	2.49
74C48	.24	74C291	2.15
74C73	.89	74C292	2.49
74C74	.89	74C293	2.49

74C00

74C00	.39	74C294	2.49
74C02	.39	74C295	2.49
74C04	.39	74C296	2.49
74C08	.49	74C297	2.49
74C10	.39	74C298	2.49
74C14	.95	74C299	2.49
74C20	.39	74C300	2.49
74C30	.39	74C301	2.49
74C42	1.95	74C302	2.49
74C48	.24	74C303	2.15
74C73	.89	74C304	2.49
74C74	.89	74C305	2.49

74C00

74C00	.39	74C306	2.49
74C02	.39	74C307	2.49
74C04	.39	74C308	2.49
7			

DEALER DIRECTORY

Los Angeles CA

Featuring: PolyMorphic, North Star, Imsai, Cromemco, Extensys, Speechlab products and Poly-88 Users Group software exchange. All products 10-20% off list. We won't be undersold! **A-A-A Discount Computer How's, 1477 Barrington, Suite 17, Los Angeles CA 90025, 477-8478.**

Palo Alto CA

Systems available for immediate delivery: word processing; multiprogramming, multi-user work in process; business; medical/dental billing and accounts receivable. Software and hardware guaranteed. **Byte of Palo Alto, 2233 El Camino Real, Palo Alto CA 94306, 327-8080.**

Denver CO

Experimenters' Paradise. Electronic and mechanical components. Computer People, Audio People, Hams, Robot Builders, Experimenters. Open six days a week. **Gateway Electronics Corp., 2839 W. 44th Ave., Denver CO 80211, 458-5444.**

Naperville IL

Discount Prices: Creed Teletypes, optical scanners, Solid State Music products, Integrant mainframes, Vista floppy-disk systems, many other items, complete hardware and software systems. **Wilcox Enterprises, 25W178-39th St., Naperville IL 60540, 420-8601.**

Prairie Village KS

Computer systems for small business applications, featuring production and inventory control, accounts rec. & pay., financial planning & general ledger. 20 yrs. experience. **Data Management Enterprises, 4900 Somerset Drive, Prairie Village KS 66207, 381-6823.**

Grand Rapids MI

Full-line microcomputer store. Ohio Scientific—Equinox—PolyMorphic Systems—Digital Systems—Godbout—Dynabyte—Thinker Toys—Meca—North Star. **Micro Computer World, 313 Michigan St., N.E., Grand Rapids MI 49503, 451-8972.**

St. Paul MN

Ohio Scientific Authorized Dealer. Complete business and personal computer systems. Store hours: Mon-Sat 9-5. Custom software design and programming. To take advantage of our many years of computer experience call, write or visit: **Frisch Computer Systems, Inc., 1415 Arcade St., St. Paul MN 55106, 771-7569.**

St. Louis MO

Experimenters' Paradise. Electronic and mechanical components. Computer People, Audio People, Hams, Robot Builders, Experimenters. Open six days a week. **Gateway Electronics Corp., 8123-25 Page Blvd., St. Louis MO 63130, 427-6116.**

White Plains NY

Processor Technology, North Star HORIZON, Apple II, Commodore PET and KIM; full line of books, components and peripherals; classes in our Seminar Room. **The Computer Corner, 200 Hamilton Avenue, White Plains NY 10601, 949-3282.**

Hickory NC

Turnkey microcomputer systems for professional, business and industrial applications, featuring Imsai (and the fabulous VDP-80). Custom software, expert service and sound advice from DP specialists. **Microcomputer Services, 108-110 Arcade Building, Hickory NC 28601, 328-3939.**

Akron OH

We've got it all. Business systems. Personal systems. Software packages. Custom programming. Terminals. Printers. Service and books. Easy freeway access. 11 AM to 7 PM Monday-Saturday. **The Basic Computer Shop, Fairlawn Plaza, 2671 West Market St., Akron OH 44133, 867-0808.**

York PA

Personal and small-business systems. Components and peripherals. Books, magazines, information. Hobbyists welcome. 1/2 block from Business 83 at Iron Bridge. **G.Y.C. Co., 51 Hamilton Ave., York PA 17404, 854-0481.**

Memphis TN

Computerlab of Memphis—Now open. Serving the mid-South with a complete line of the most popular systems. **Computerlab, 627 South Mendenhall Rd., Memphis TN 38117, 761-4743.**

Houston TX

Bare boards, kits, small systems, multiuser systems, custom hardware design, software for business or hobby, nationwide consulting available. Please call. **Houston Computer Mart, 8029 Gulf Freeway, Houston TX 77017, 649-4188.**

Richland WA

Apple, North Star, Ohio Scientific. All products listed in Byte Shopper, classes, literature, electronic parts, repair service. Custom design/consulting in both hardware and software. **Ye Olde Computer Shoppe, Inc., 1301 George Washington Way, Richland WA 99352, 946-3330.**

Hobbyists, Businessmen

Use this Dealer Directory when you need a computer store. These dealers are actively looking to supply your needs in the home and business computer market.

Dealers: Listings are \$15 per month in prepaid quarterly payments, or one yearly payment of \$150, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Marcia at 603-924-3873 or write *Kilobaud*, Ad Department, Peterborough NH 03458.

**Everyone at Kilobaud
wishes you a Happy New Year.**

MOVING?

Let us know 8 weeks in advance so that you won't miss a single issue of *Kilobaud*.

Attach old label where indicated and print new address in space provided. Also include your mailing label whenever you write concerning your subscription. It helps us serve you promptly.

- Address change only
- Extend subscription
- Enter new subscription
- 1 year \$18.00
- Payment enclosed
(1 extra BONUS issue)
- Bill me later

If you have no label handy, print OLD address here.

AFFIX LABEL
Name _____ Call _____
Address _____
City _____ State _____ Zip _____

print NEW address here:

Name _____ Call _____
Address _____
City _____ State _____ Zip _____

• KILOBAUD • PETERBOROUGH NH 03458 •

KB BACK ISSUES

<p>kilobaud The Computer Hobbyist Magazine</p> <p>ISSUE #1 January 1977</p> <p>Articles</p> <p>Is the Z80 the Wave of the Future? 29 Tiny BASIC... a micro-computer for your micro 34 How to Make a Micro-Computer 40 Software Exchange... introducing the hobby road 44 Practical Microcomputer Programming... Part 1: Logical Instructions 50 Wall, You're on the Line! 54 Computer Control of the Home 57 Surfing at a Distance: on and off with your computer 62 Wire Wrapping... Try It! 64 The Micro-Computer: A New Dimension in Personal Computing 66 Solving Some of the Software Interchange Problems 70 Welcome to Assembly Language Programming 74 Programs in BASIC's "Disk" 78 Disk-based Programs... just out of control 82 Computers in Golf... why for the handicapped 86 Computer Videos 88 How to Make a Micro-Computer Sound 90 How to Use the New PR-49 Printer 94 First... your micro-computer for help 96 A Micro-Computer for the Home 98 Notably BASIC Will Make You Smile 102 Described Programs 104 Six Games on a Chip... a TV-computer game 106 Computer Games 108</p> <p>Features</p> <p>Publisher's Remarks 2 Letters 7 The BASIC Forum 16 Editor's Remarks 4 Books 11 Around the Industry 16 Letters 16 News of the Industry 8 Looking Ahead 13 Glossary 134</p>	<p>kilobaud The Small Computer Magazine</p> <p>ISSUE #2 February 1977</p> <p>Articles</p> <p>ZAPI 18 Designing a Micro-Computer 20 Why So Many Computer Languages? 26 The Remarkable Apple Computer 30 Software Exchange... a hobby road 34 Chess 38 Will the Z80 Crash All Your Programs? 39 Practical Microcomputer Programming... Part 2: Operating Systems 44 The Troubles with New Storage Systems 47 Subroutine... a program for the Z80 50 The Homebrew Operating System - Part 2: Interfacing with the Monitor 54 Pascal: A Language for the Computer Age 58 Sophisticated Software Keyboard 60 How to Make a Micro-Computer Sound 62 RCA's New Color TV Computer 64 8080 vs. 320... who does better? 66 Controlling Time with this Extraordinary Program 68 7 x 8 = 40 - Digital 70 Learning Computation 74 How to Make a Micro-Computer Game 76 Making Money is a Hobby 78 TM 8080 You May Have Missed 80 The "V" in VDU 82 A 6500 Disk Reader 84 A 6500 Graphics Display 86 Computerized Dimensions... the answer to slow paying customers 88</p> <p>Features</p> <p>Publisher's Remarks 3 Around the Industry 6 The BASIC Forum 13 Editor's Remarks 4 Books 11 Letters 16 News of the Industry 8 Looking Ahead 13 Glossary 134</p>	<p>kilobaud The Small Computer Magazine</p> <p>ISSUE #3 March 1977</p> <p>Articles</p> <p>Practical Microcomputer Programming... Part 2: Software Tools 18 The Micro-Computer: A Hobbyist's Review of the MITSK80 24 Let's Make It for the Z80... an easy building project 30 The Pico-View Computer: build your own computer 34 The 6500: a micro-computer for the hobbyist 37 A New Approach to the Z80 the Ascent 2000 42 Jumping into the CPU... the way from within 44 Only Five Dollars... add a few with the converter 46 Floppy Disk... what's the real story? 48 The Ascent 2000: a hobbyist's review 50 How to Make a Micro-Computer Sound 52 Using the "8080" Terminal 54 External Mass Storage... Part 2: Digital and Audio Systems 56 Make Your 6500 Smarter... a cheap memory expander 58 Stop Browsing... take time to design your next program 60 Clockwise Logic... Part 1: The D Type and JK Flip-Flop 62 The Glory Details of Computer Storage 64 The BASIC Forum 66 Super BASIC... the way to write your own programs 68 Super Take... setting up the Digital Group TTV 70</p> <p>Features</p> <p>Publisher's Remarks 2 News of the Industry 5 Looking Ahead 13 Editor's Remarks 4 Letters 8 Glossary 134</p>	<p>kilobaud The Small Computer Magazine</p> <p>ISSUE #4 April 1977</p> <p>Articles</p> <p>Intelligent Expansion... using microprocessor internal capability effectively 18 Clocked Logic... Part 2: Some Basic Applications 22 Build an Eight-Channel Multiswitch for Your Scope 26 The Micro-Computer: a hobbyist's review of the MITSK80 28 Number Rounding Program... introducing the decimal 30 Meet the Turbo-80 Interface 32 Solderless Breadboard 34 The Homebrew Computer Part 2: Command Language Processing 34 The Stone-Splitting Debugger 36 BASIC - The Language of the Computer 38 New York's First Software Training Center 40 KIM 1 Memory Expansion adding memory to the popular system is a snap 42 Heavy Duty Power Supply just for an entire system 44 Digital Group's New 6500 Computer 46 HS-LO - increase your word when you want 48 Introducing the Analog World 50 Everyone Needs a Computer Monitor ... but what is it needed for BASIC? 52 Three-State Logic explanation of a key microprocessor element 56 Automatic Memory Dump... utility dump program for 6500 users 58 Hercules Graphics 60 Now... BASIC for the 8008! 62 Microprogramming... an insight into microprocessor design 64 Computerized Business... graphic display for business 66</p> <p>Features</p> <p>Publisher's Remarks 2 The BASIC Forum 17 Editor's Remarks 4 Around the Industry 14 Letters 6 Letters 16 Bookshelf 8 Computers 40 Around the Industry 10 Glossary 134</p>
<p>kilobaud The Small Computer Magazine</p> <p>ISSUE #5 May 1977</p> <p>Articles</p> <p>Clocked Logic... Part 2: Data Converters and Special Functions 24 Build Your Own Interface 26 Computer Club Promotional Techniques 26 Make Your Computer Sound 28 Speed Up Your 6500 30 What's New in RS-232C... Data communications explained! 32 It is High... or Low... understanding logic design conventions 34 How to Make a Micro-Computer Game 36 Programming System Expanded... a working look at the increment of the Z80 38 Interrupts Explored... Part 2: Implementing an interrupt-driven System 40 Digital Audio Part 2: Generating that World Music 42 Now It's Intra-BASIC 44 Kilobaud Klassroom 46 Add-in Plugs... for your system... a must-have for computer games 48 Lunar Lander 50 Silence Never Telepathic Means... with a pulse-tube relay 52 Structural BASIC is Better! 54 Kilobaud Klassroom 56 A Home Computer Primer... getting the best reading 58 Books 60 Letters 62</p> <p>Features</p> <p>Publisher's Remarks 3 Books 12 Editor's Remarks 3 Around the Industry 14 Hardware & Software Review 4 The BASIC Forum 17 News of the Industry 8 Letters 18 Lookahead 10 Glossary 134</p>	<p>kilobaud The Small Computer Magazine</p> <p>ISSUE #6 June 1977</p> <p>Articles</p> <p>Build Your Own Interface 16 from a professional 18 Computer Club Promotional Techniques 20 from you can afford Median-Ave 20 Artistry Practice 22 Put a Movie in Your School 24 - getting started with zero budget! 24 Terminal Emulation... adding a new dimension to your computer 26 Build a Video Generator 28 - a new way to look at video 28 ATV For Your KIM 30 - at price you won't believe 30 The BYTESDESTROYER... order an EPROM reader 32 BASIC Timing Computer information for those of you who have never heard of it 34 Building a Micro-Computer 36 - how to do it for a buck 36 A Clean Computer... getting the most from your computer 38 Try a Digital Computer... for practical hardware prototyping 40 Try Solar Energy... a compensated inverter in the energy crisis 42 Simplified BASIC 44 - a look at the new version of the language 44 Kilobaud Klassroom 46 - 2nd year and first refresh 46 Converted Typewriter... an introduction to word processing 48 Introducing The World's Cheapest Computer... a 6500 SCMP 50 My Friend is a Computer Junkie 52</p> <p>Features</p> <p>Publisher's Remarks 2 Books 14 Editor's Remarks 2 Around the Industry 16 Letters 16 The KIM Forum 4 Books 17 News of the Industry 8 Corrections 141</p>	<p>kilobaud The Small Computer Magazine</p> <p>ISSUE #7 July 1977</p> <p>Articles</p> <p>Inside the Silver Microprocessor 16 intelligence for your pocket 18 The Great T1 to CRT Monitor Converter 20 and a new computer system 20 Computer Tunes Direct... an interview with Jimper John Whipple 22 The Random Number Game 24 Create Interface First Aid... use your processor as an inverter 26 Understand Your Computer's Language... a look at instruction sets 28 Kilobaud Klassroom 30 - the basics of computer peripherals 30 Digital Audio... Part 2: Signal Expansion and Compression 32 Digital Image Processing 34 - a look at the new field 34 Pico-View Computer 36 - a look at the new computer 36 Put the Books... computer education programs 38 Inside the Amico AS3... checking out the most popular terminal 40 Try Computer Competition... each round it's gold 42</p> <p>Features</p> <p>Publisher's Remarks 2 Books 14 Editor's Remarks 2 News of the Industry 5 Kilobaud Calendar 29 The KIM Forum 4 Books 17 News of the Industry 8 Corrections 141</p>	<p>kilobaud The Small Computer Magazine</p> <p>ISSUE #8 August 1977</p> <p>Articles</p> <p>Carson 102 Format... characters are compressed! 18 The Micro-Computer: a hobby road 20 and a new computer system 20 Trigger Your Oscilloscope 22 and a new computer system 22 Silent Type Program 24 - high quality screen display 24 Random Interface Program for games, sorting, or statistics 26 Test T1 With Your Micro... the basics of computer peripherals 28 Micro-Computer Games... order now for the new computer 30 Is the KIM 1 Far Easier? 32 - and not it's far out! 32 Electronic Design by Computer... simplify your next project? 34 Understand Your Computer's Language... Part 2: Instruction Sets 36 Title Books... a look at the new computer 38 Try a Do-It-Program... it will even balance your checkbook 40 See, You Want to be a Author? 42 SIMP for BASIC Notes... implementation of the SIMP 44 Hercules Graphics 46 - a look at the new computer 46 Does a Few Good Computer Club... don't wait until the last 48 Troubleshoot Your Software... a new program for the 6502 50 Care for Hot Power Supply 52</p> <p>Features</p> <p>Publisher's Remarks 2 Books 10 Editor's Remarks 4 The BASIC Forum 11 Legal/Business Forum 6 Letters 12 The KIM Forum 7 Computers 18 News of the Industry 8 Kilobaud Calendar 140</p>
<p>kilobaud The Small Computer Magazine</p> <p>ISSUE #9 September 1977</p> <p>Articles</p> <p>Micro-Computer Games... with serial and parallel input 22 The Micro-Computer: a hobby road 24 The Micro-Computer: a hobby road 26 Tell Your Computer's Language... what can it do for you? 28 A PET for Every Home... a look at the Commodore PET 2000 30 Kilobaud Klassroom 32 - PC boards and power supply 32 Save Electronics... a visit with the memory people 34 Try an 8080 Emulator... valuable debugging technique 36 Build a 6500 ROM Program... for your hobby computer 38 Parallel Port Interface 40 - a look at the new computer 40 Cleaning Drive Control Code... use a UATF, indirectly 42 Tactical Assembler Language... now you buy it at a time! 44 Basic in BASIC... new rules for all game 46 Using an Inexpensive ROM... how to make monitor programs 48 Kilobaud Klassroom 50 - bring 'em back alive! 50 Starting a Business... profit by word! 52 Letters 102</p> <p>Features</p> <p>Publisher's Remarks 2 Books 11 Editor's Remarks 3 Around the Industry 13 The KIM Forum 4 Books 16 Legal/Business Forum 6 Kilobaud Calendar 152 The BASIC Forum 7 Computers 152 New Products 8</p>	<p>kilobaud The Small Computer Magazine</p> <p>ISSUE #10 October 1977</p> <p>Articles</p> <p>BASIC Timing Computer... created and updated 20 Learn and Earn... BASIC and business programming 22 Sergio Tolle... a hobbyist's review 24 Hello! Today's Programs... a look at computer speech recognition 26 Save the Apple II... it's not as compatible as you should 28 Put Your Image on the PET... it's not that hard 30 32K RAM for the 6500... a look at the new computer 32 Memory Troubleshooting Techniques... take a bit for a look 34 Understand Your Interface... real time applications 36 Kilobaud Klassroom 38 - a look at the new computer 38 Digital Group MAX-10 Maxi-Board 40 Universal ROM Code... a look at the new computer 42 Deflected Control... there's a move in the field 44 Try WORM/ROM... a computer assisted instruction 46 Time for Timers!... write him a program 48 Build a Universal I/O Board... for your PET 50 Letters 102</p> <p>Features</p> <p>Publisher's Remarks 3 Around the Industry 14 Editor's Remarks 3 The KIM Forum 16 Legal/Business Forum 4 Kilobaud Calendar 158 The BASIC Forum 5 Computers 158 Letters 10</p>	<p>kilobaud The Small Computer Magazine</p> <p>ISSUE #11 November 1977</p> <p>Articles</p> <p>Everything about Assembler... learn how to program 24 Your Image Counter... perfect for business 26 Lifetime Program... will you make it 28 Computer Tunes Direct... an interview with the PET 2000 30 Time of Subroutine Usage... alternative to the ASR-32 32 Stretch Those Characters... mode for the SMT9 PR-40 34 Magnetic Bubble Technology... new technology 36 Software, Hardware and Coffee... profit by word! 38 Isoper about Show Load Times... KIM Hyperdrive is an alternative 40 Micro-Computer Games... a look at the new computer 42 Kilobaud Klassroom 44 - a look at the new computer 44 Letters 102</p> <p>Features</p> <p>Publisher's Remarks 4 Around the Industry 17 Editor's Remarks 6 The KIM Forum 18 Letters 10 The KIM Forum 12 Letters 20 Legal/Business Forum 14 Kilobaud Calendar 158 The KIM Forum 16 Corrections 118</p>	<p>kilobaud The Small Computer Magazine</p> <p>ISSUE #12 December 1977</p> <p>Articles</p> <p>TV/T Hardwire Design... Part 1: instruction decoder and logic 30 Expand Your KIM... Part 2: getting the most out of it 32 Project: Project 1000... a look at the new computer 34 The Business Market... and the business of going after it 36 ALL CAPS... should be in red? 38 The "Learning Machine"... teach your computer 40 Kilobaud Klassroom 42 - a look at the new computer 42 Computer Guide to Logic Diagrams... the right way to program 44 Rabbit Radio 46 - a look at the new computer 46 The Twelve Days of Christmas 48 Paper Tape It's New to See... a look at the QP-80A 50 Tapeless Fug... 52 Who's a Good Book... analyze your books on home 54 New Books 56 - a look at the new computer 56 Crash Landing... a real time Lunar Lander game 58 File Structure Simplified... design your own operating system 60</p> <p>Features</p> <p>Publisher's Remarks 4 The BASIC Forum 17 Editor's Remarks 6 Letters 21 Around the Industry 7 1977 INDEX 120 Books 8 Computers 123 New Products 12 Corrections 123 Legal/Business Forum 16</p>

All issues subject to availability!

Please send Kilobaud back issues:

Issues JAN 77-\$5 Issues AUG 77-\$3
Issues FEB 77-\$3 Issues SEPT 77-\$3
Issues MAR 77-\$3 Issues OCT 77-\$3
Issues APR 77-\$3 Issues NOV 77-\$3
Issues MAY 77-\$3 Issues DEC 77-\$3
Issues JUNE 77-\$3 Issues JAN 78-\$10
Issues JUL 77-\$3 Issues TOTAL: _____

Add \$1.00 shipping & handling for all orders under \$10.00.

BankAmericard/Visa Master Charge American Express

Card # _____ Expiration date _____

Signature _____

Name _____

Address _____

City _____ State _____ Zip _____

Have credit card # handy and call
TOLL FREE (800) 258-5473
Kilobaud • Peterborough NH 03458

K25C

KB BOOK NOOK

• **HOBBY COMPUTERS ARE HERE!**—BK7322—If you want to come up to speed on how computers work . . . hardware and software . . . this is an excellent book. It starts with the fundamentals and explains the circuits, the basics of programming, along with a couple of TVT construction projects, ASCII-Baudot, etc. This book has the highest recommendations as a teaching aid for newcomers. \$4.95.*

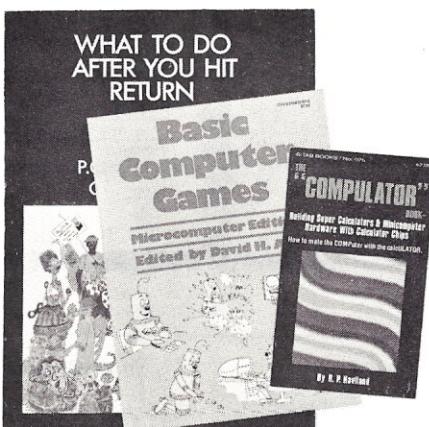
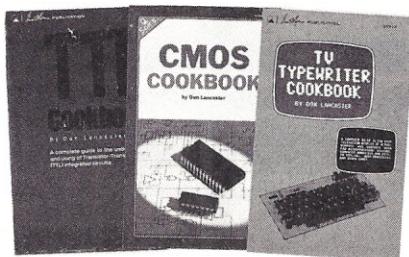
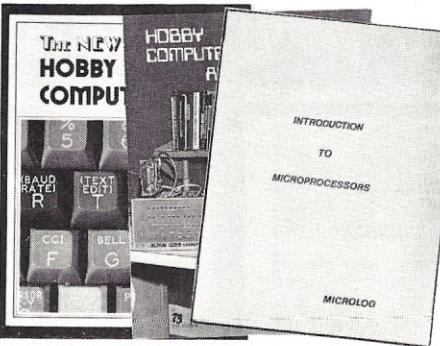
• **THE NEW HOBBY COMPUTERS**—BK7340—This book takes it from where "Hobby Computers Are Here!" leaves off, with chapters on Large Scale Integration, how to choose a microprocessor chip, an introduction to programming, low cost I/O for a computer, computer arithmetic, checking memory boards, a Baudot monitor/editor system, an audible logic probe for finding those tough problems, a ham's computer, a computer QSO machine . . . and much, much more! \$4.95*

• **INTRODUCTION TO MICROPROCESSORS**—BK1032—by Charles Rockwell of MICROLOG is an ideal reference for the individual desiring to understand the hardware aspects of microprocessor systems. Describes the hardware details of computer devices in terms the beginner can understand, instead of treating the micro chip as a "black box." Specific systems are not described and programming is only briefly discussed. \$17.50 US and Canada, \$20 elsewhere.*

• **BASIC NEW 2ND EDITION**—BK1081—by Bob Albrecht. Self-teaching guide to the computer language you will need to know for use with your microcomputer. This is one of the easiest ways to learn computer programming. \$4.95.*

• **SCIENTIFIC RESEARCH INSTRUMENTS' BASIC SOFTWARE LIBRARY** is a complete do-it-yourself kit. Written in everybody's BASIC immediately executable in ANY computer with 4K, no other peripherals needed. **Volume I** contains business and recreational programs and is 300 pages. **Volume II** is 260 pages and contains math, engineering, statistics and plotting programs. **Volume III** contains money managing, advanced business programs such as billing, A/R, inventory, payroll, etc. **Volume IV** contains general purpose programs like loans, rates, retirement, plus games: Poker, Enterprise (take charge while Capt. Kirk is away), Football and more! **Volume V** is filled with experimenter's programs including games, pictures and misc. problems like "logic." **Volume I**—LB1002—& **Volume II**—LB1003—\$24.95* each, **Volume III**—LB1004—\$39.95*, **Volume IV**—LB1005—& **Volume V**—LB1006—\$9.95* each, **Volume VI**—LB1007—\$49.95*, **Volume VII**—LB1008—\$39.95.*

• **MICROPROCESSOR INTERFACING TECHNIQUES**—BK1037—by Austin Lesea & Rodney Zaks will teach you how



to interconnect a complete system and interface it to all the usual peripherals. It covers hardware and software skills and techniques, including the use and design of model buses such as the IEEE 488 or \$100. \$9.95*

• **TTL COOKBOOK**—BK1063—by Donald Lancaster. Explains what TTL is, how it works, and how to use it. Discusses practical applications, such as a digital counter and display system, events counter, electronic stopwatch, digital voltmeter, and a digital tachometer. \$8.95.

• **CMOS COOKBOOK**—BK1011—by Don Lancaster. Details the application of CMOS, the low power logic family suitable for most applications presently dominated by TTL. Required reading for every serious digital experimenter! \$9.95.*

• **TV COOKBOOK**—BK1064—by Don Lancaster, describes the use of a standard television receiver as a microprocessor CRT terminal. Explains and describes character generation, cursor control and interface information in typical, easy-to-understand Lancaster style. \$9.95.

• **THE "COMPULATOR" BOOK—BUILDING SUPER CALCULATORS & MINICOMPUTER HARDWARE WITH CALCULATOR CHIPS**—BK1012—by R. P. Haviland, provides ideas, design info and printed circuit boards for calculator chip projects, measure time, tie in with a Teletype to create a virtually infinite memory system, and countless other functions. \$7.95.*

• **BASIC COMPUTER GAMES**—BK1074—Okay, so once you get your computer and are running in BASIC, then what? Then you need some programs in BASIC, that's what. This book has 101 games for you, from very simple to real buggers. You get the games, a description of the games, the listing to put in your computer and a sample run to show you how they work. Fun. Any one game will be worth more than the price of the book for the fun you and your family will have with it. \$7.50.*

• **WHAT TO DO AFTER YOU HIT RETURN**—BK1071—PCC's first book of computer games . . . 48 different computer games you can play in BASIC . . . programs, descriptions, many illustrations. Lunar Landing, Hammurabi, King, Civel 2, Qubic 5, Taxman, Star Trek, Crash, Market, etc. \$8.00.*

• **KILOBAUD CODING SHEETS** Kilobaud's dozen or so programmers wouldn't try to work without these handy scratch pads which help prevent the little errors that can cost hours and hours of programming time. Available for programming is **Assembly/Machine Language** (PD1001) which has columns for address, instruction (3 bytes), source code (label, op code, operand), and comments; and for **BASIC** (PD1002) which is 72 columns wide. 50 sheets to a pad. \$2.39.*

* Use the order card in the back of this magazine or itemize your order on a separate piece of paper and mail to: Kilobaud Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. For orders under \$10.00, add \$1.00 shipping and handling.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

KB BOOK NOOK

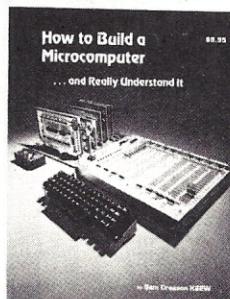
• **HOW TO BUILD A MICROCOMPUTER—AND REALLY UNDERSTAND IT**—BK7325—by Sam Creason. The electronics hobbyist who wants to build his own microcomputer system now has a practical "How-To" guidebook. Sam Creason's book is a combination technical manual and programming guide that takes the hobbyist step-by-step through the design, construction, testing and debugging of a complete microcomputer system. This book is must reading for anyone desiring a true understanding of computer systems. \$9.95.*

• **PROGRAMMING IN PASCAL**—BK1140—by Peter Grogono. The computer programming language PASCAL was the first language to embody in a coherent way the concepts of structured programming which had been defined by Edsger Dijkstra and C.A.R. Hoare. As such it is a landmark in the development of programming languages. PASCAL was developed by Niklaus Wirth in Zurich; it is derived from the language ALGOL 60 but is more powerful and easier to use. PASCAL is now widely accepted as a useful language that can be efficiently implemented, and as an excellent teaching tool. \$9.95.*

• **MICROPROCESSOR LEXICON—ACRONYMS AND DEFINITIONS**—BK1137—Compiled by the staff of SYBEX is a convenient reference in pocket size format. Sections include acronyms and definitions, part numbers and their definitions, S-100 signals, RS232 signals, IEEE 499 signals,

SPECIAL PRE- PUBLICATION OFFER

(orders will
be filled
on a
first-in,
first-out
basis)



microcomputer and microprocessors, JETDS summary (military) and a code conversion table. \$2.95.*

• **INSTANT BASIC**—BK1131—by Jerald R. Brown. For the personal computer enthusiast or the user of DEC's BASIC PLUS language, here, finally, is a new book to teach you BASIC. It teaches BASIC to beginners using interesting programming ideas and applications that will be easily understood by the home computer programmer. BASIC PLUS users know that the two languages are very similar, so this book can be used by them as well. This is an "active participation" workbook, designed to be used with your home computer so you can learn by doing! \$6.00.*

• **YOUR HOME COMPUTER**—BK1172—by James White is an introduction to the world of personal microcomputing. Written in clear and understandable language, this book tells you everything you want to know about home computing and gives the computer novice a painless introduction to microcomputer technology and terminology, beginning with what computers are and how they work.

It provides information about home computer kits, guidelines for selecting and building your own microcomputer, how to use your home computer and what you can do with it, lists of computer stores, clubs, periodicals, and answers to many more of your questions about microcomputers and the jargon surrounding the personal computing scene today. \$6.00.*

KB BOOK NOOK ORDER FORM

Qty.	Cat.#	Description	Unit Price	Total

Add \$1 shipping & handling for orders under \$10:

Merchandise total:

SUBSCRIBE!

Kilobaud One year—KB: \$18* 3 years—Kilobaud: \$45*
 73 One year—73: \$18* 3 years—73: \$45*
 Life Sub (73/KB) \$195** New Sub Renewal Subscription total: _____

*U.S. & Canada only

**U.S. only

Enclosed _____

Check

Money order

Bill my: Visa Master Charge American Express

Credit card # _____

Expiration date _____

Signature _____

Name _____

Address _____

City _____

State _____

Zip _____

Total subscription
&/or merchandise:

kilobaud

peterborough nh 03458

For Toll Free Ordering: (800) 258-5473

(coupon expires in 60 days)

K1 A

FOR CUSTOMER SERVICE CALL (603) 924-6132

Output from Instant Software Inc.

by Sherry Smythe

Instant Software has acquired a new home in Peterborough. The new location has enough office space for current usage and projected 1979 expansion plus land suitable for a new building. This will be a big improvement over our tiny offices at 73 headquarters.

We're growing fast, and all this new space will allow us to hire the additional personnel we so badly need. We're hiring now—send resume with salary history included.

We need assistance from our programmers, too. Programmers can speed up the handling of their programs by putting only one program on a cassette. To eliminate confusion and to assure proper cassette identification, it is essential that every cassette be labeled with the programmer's name, address, zip code, name of program and the type of computer for which it was designed. The same data is required for the documentation.

It is also very important to indicate on the label if the program is a "revised" version or not. Spell out details of the revisions in an accompanying cover letter.

When programs are submitted, the first step in our publishing routine is to send an acknowledgement packet, which includes our standard contract form. On a programmer's return of the signed contract, we start the review and evaluation procedures.

Upon our final acceptance of a program for publication, the programmer receives from us a copy of the completely signed contract for his files. The programmer is notified by mail of any rejections. If the programmer wants his cassette and documentation returned, he must submit a self-addressed stamped envelope with his material when it is first submitted. The SASE will be returned unused to programmers whose programs are accepted.

Good graphics and detailed instructions are essential to make programs salable. Nobody is impressed by looking at a cursor while wondering what to do next to get some action on the CRT—this goes for revisions, too!

Remember—customers will predominantly be non-programmers who just want to load a program and run it. To assist them, we've improved our packaging to make it easier to determine which computers our published programs are meant for.

If you want to have your program(s) published by **Instant Software**, send us an SASE. We'll send you details about our plans to make programmers wealthy, and do our best to answer your questions.

Programmers should check with the I.R.S. to determine if their personally owned computer costs qualify for any business deduction at tax time when they use it to write programs for possible publication by **Instant Software**.

Instant Software Inc.

a product of 1001001 inc. peterborough, nh 03458

IS HARD COPY STORAGE A PROBLEM?



Kilobaud, as thick as it is, is more like a floppy when it comes to standing on the bookshelf. Try the Kilobaud Library Shelf Boxes, . . . sturdy corrugated white dirt resistant cardboard boxes which will keep them from flopping around. We have self-sticking labels for the boxes, too, not only for **Kilobaud**, but also for **73 Magazine** . . . and for **Personal Computing**, **Radio Electronics**, **Interface Age**, and **Byte**. Ask for whatever stickers you want with your box order. Hams may want our labels for **CQ**, **QST** or **Ham Radio**. They hold a full year of **Kilobaud** . . . or **73**. Your magazine library is your prime reference, keep it handy and keep it neat with these strong library shelf boxes . . . One box is \$2.00, 2 boxes are \$3.00 and eight boxes are \$10.00. Be sure to specify which labels we should send. Have your credit card handy and call our toll-free order number 800-258-5473, or use the order card in the back of the magazine and mail to:

KILOBAUD LIBRARY SHELF BOXES Peterborough, NH 03458

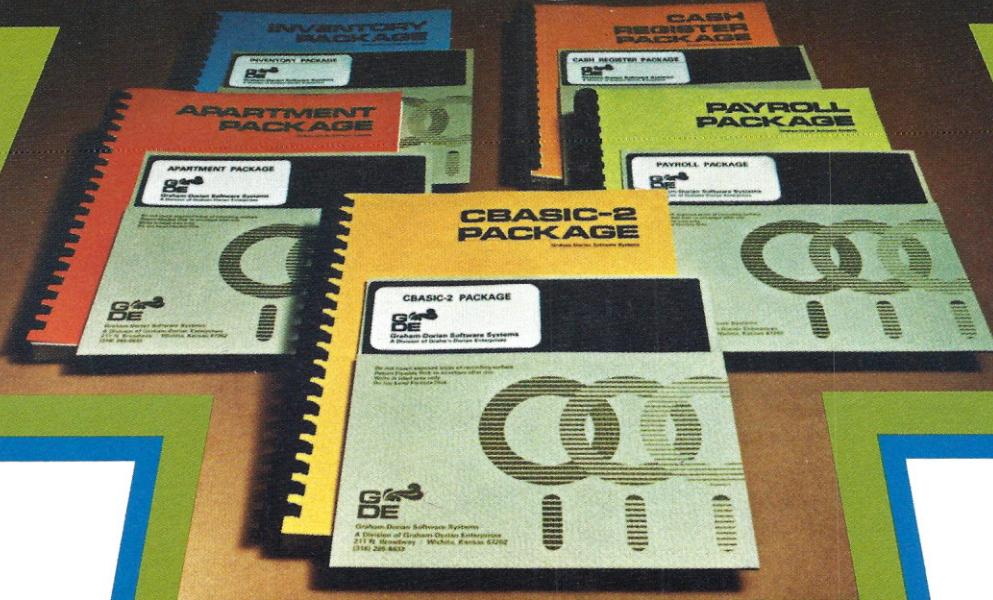
kilobaud
MICROCOMPUTING

INDEX TO ADVERTISERS

A73 Addmaster Corp.....	81	D34 D & N Micro Products.....	123	M67 Microsette Co.....	122	S73 Significant Software.....	110
A38 Advanced Computer Prod.	129, 137	D20 Digital Research Corporation.....	135	M44 Micro Technology Unltd.....	112	S51 Small System Software.....	99
A48 Alpha Data Systems.....	123	D42 DSI Instruments.....	17	M70 Midwest Scientific.....	CIV	S52 Southeastern Software.....	121
A74 American Data Home Computer	3	E34 Ecosoft.....	81	M65 MJB Computer Associates.....	112	S61 Supersoft.....	123
A66 American Square Computers.....	86	E18 Electravalue Industrial.....	120	M32 Mullen Computer Products.....	116	S6 SWTPC.....	CII
A71 Automated Simulations.....	111	E29 Esstoo-Deetoo.....	121	N15 Netronics R & D Ltd.....	107	S42 Sybex, Inc.....	117
B33 The Bottom Shelf, Inc.....	33	F8 Forethought Products.....	108, 118	N7 Newman Computer Exchange.....	134	S68 Syntek Systems Corporation.....	27
B43 Buss.....	108	G4 Godbout Electronics.....	138	N16 Northeast Microware.....	86	T37 Tano Corp.....	52
B14 Byte Shop East, Inc.....	110	G24 GPA Electronics.....	115	N13 Nucleus, Inc.....	86	T11 Tarbell Electronics.....	121
C109 Compusoft Publishing.....	43	G20 Graham-Dorian Enterprises.....	CIII	O1 Ohio Scientific.....	4, 5	T26 Telecommunications Services.....	121
C64 Computer Corner of NJ.....	123	H26 Hartwell's Office World.....	112	O2 On-Line.....	122	T51 Telsis Laboratory.....	91
C28 The Computer Corner.....	123	H25 Hobby World.....	125	O10 Optimal Technology, Inc.....	121	T13 Teletypewriter Comm. Specialists.....	104
C33 Computer Enterprises.....	111, 119	I24 Innovative Technology.....	86	O8 Orthon Computers.....	104	T28 Thinker Toys.....	100, 101
C104 Computer Information Exchange.....	123	I30 Input/Output Unlimited.....	87	O6 Osborne & Associates, Inc.....	47, 105	T50 Tiny C. Associates.....	56
C30 Computer Mart of NJ.....	110	I32 Instant Software.....	70, 71	O9 Otto Electronics.....	110	T41 Total Information Services, Inc.....	120
C103 Computer Packages, Unltd.....	123	I39 Integrated Circuits Unlimited.....	136	P9 PAIA.....	124	T47 Trans-Data Corporation.....	115
C80 Computer Port.....	43	I28 Interactive Computers.....	114	P38 Pan American Electronics.....	121	T46 Transition Enterprises.....	93, 119
C100 The Computer Store, Inc.....	57	Ithaca Audio.....	31	P7 Percom Data Company, Inc.....	61	T1 Tri-Tek, Inc.....	139
* Computer Systems Design.....	108, 124	I31 International Electronic Equip.....	111	P39 Personal Software.....	106	T49 Petronic Computer Store.....	53
C73 Computer Systems Store.....	122	J1 Jameco Electronics.....	140, 141	P37 Pet Shack Software House.....	43	V19 VR Data Corporation.....	96
C94 The Computerist.....	96	J4 Johnson Comp56, 93, 97, 109, 119, 124		P43 Plainsman Micro Systems.....	86, 123	W22 Wameco, Inc.....	132
C81 Computers One.....	53, 120	J12 JPC Products Company.....	113	P21 Priority One Electronics.....	131	W20 WEB Associates.....	104
C86 Computrex.....	121	K14 Key Electronics.....	122	Q8 Quant Systems.....	122	W21 Western I/O.....	114
C107 Connecticut microComputer.....	115	L19 Level IV.....	124	Q3 Quest Electronics.....	133	W16 World Wide Electronics.....	122
C108 The CPU Shop.....	120	M49 Marinchip Systems.....	81	R24 Racer Computers.....	122	X2 X & Y Enterprises.....	120
C97 Creative Software.....	119	M17 Marketline, Inc.....	120	R12 Rainbow Computing, Inc.....	123	From Kilobaud.....	Pages 51, 143-146
D41 Dad's Reliable Software.....	81	M64 Mathematical Applications Ser.....	113	R8 Ramsey Electronics.....	128		
D43 Dr. Daley.....	120	M24 Meca.....	99	R23 RCA.....	13		
D40 Datasearch.....	111	M74 Micro.....	86	R25 F. Reichert & Sales.....	130		
D32 Data Vector Corporation.....	122	M30 Micro Computer Devices.....	63	* RNB Enterprises.....	126, 127		
D28 Deltroniks.....	120	M73 Micromail.....	128	R26 R.S.H. Electronics.....	108		
D37 Digital Dynamics, Inc.....	53, 120	M54 Micro-Mega.....	122	S55 3 S Sales.....	113		

*Reader Service inquiries not honored.
Please contact advertiser directly.

Programs you can use in your business... ready to go now!



Our programs will let you realize the full potential of your hardware.

We developed these programs because we needed them in our businesses, and, try as we might, could not purchase them. They're on-line now, working for us and others around the country.

As users ourselves we know the problems from your perspective — not just as a manufacturer of software. The bugs are out and they're ready now to go to work helping make your life easier, keeping you in better control of your business.

Our first four program packages are: • Apartment Management • Cash Register • Inventory • Payroll
Here's a typical program

To give you an idea of the thoroughness of these programs, here's a summary of what the inventory package does for you. Gives a detailed listing of items in inventory and itemizes all goods sold from inventory, including which sales person sold what, when it sold and for how much... recaps on one sheet this same inventory activity information... investigates and changes any information in inventory, on request... prints list of items to be re-ordered... provides profit analysis comparing sales personnel and/or various products. And it can be inter-connected with our cash register package as well, for total program management.

Each of our initial programs is conceived, proven and offered with this same exacting thoroughness and attention to detail.

We stay with you after the sale

We're in this for the long haul and our support program is dedicated to that objective. Registered program owners receive:

Master Charge and Visa cards accepted

- Periodic newsletters which include users' ideas and information exchange, plus tips to owners on further increasing benefits of the package through updated operational flexibility.
- Availability of software technicians to provide immediate answers to questions, via phone or mail.
- Customer rewrites and adaptations available on request, at added cost.

CBASIC-2 free

It takes the world's most powerful commercial basic to run our programs and we deliver it to you free.

Each of our program packages contains a disk with CBASIC-2 Compiler, CBASIC-2 Run Command and your Graham-Dorian software programs in INT and BAS file form. You also receive User's Manuals and Hard Copy Source Listing. At a price which pays for itself!

CBASIC-2 was developed and written by Software Systems, the people who wrote CBASIC, and includes many powerful enhancements.* All systems are compatible with any Z-80 or 8080 CP/M™ system. They are deliverable in standard eight-inch disk — either double or single density — or mini-floppy disk.

Give us a call or fill out the Reader Service Card in this issue. We promise a response within 24 hours of receipt.

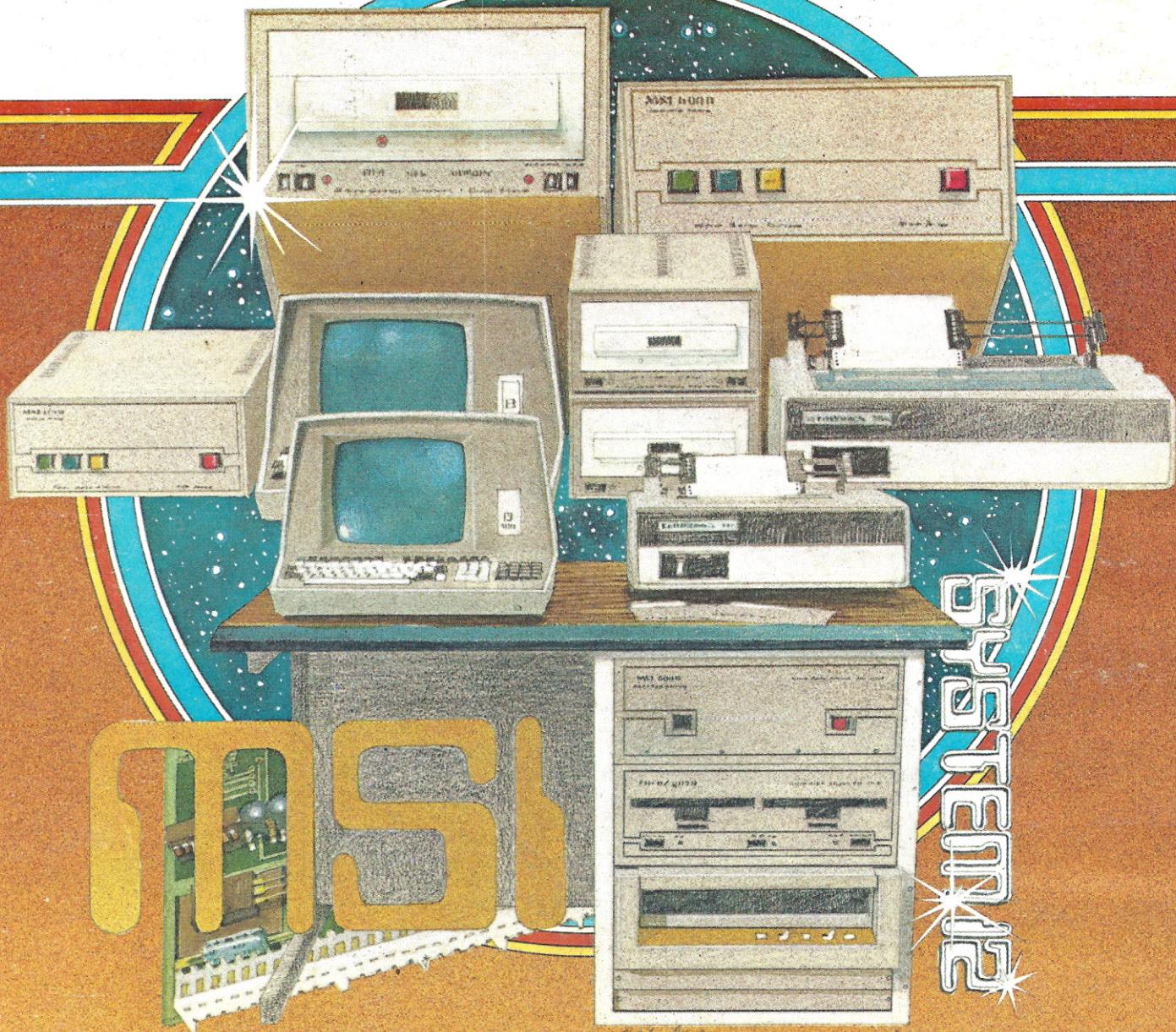
That's the kind of information service we expect, and know you do too.

*CBASIC-2 may be purchased separately
from Graham-Dorian Software Systems for \$89.95.



Graham-Dorian Software Systems
A Division of Graham-Dorian Enterprises
211 N. Broadway / Wichita, Ks. 67202 / (316) 265-8633

All Systems Are Not Created Equal



Your computer application is unique. It differs from all others. It is because not all applications are equal that MSI has developed a variety of computer systems.

At the heart of every MSI System is the powerful MSI 6800 Computer, one of the fastest and most versatile available. Depending on the System you select, the MSI 6800 has from 16K to 56K of RAM. Mass memory storage in MSI Systems range from 315K bytes in the System 1 to over 76 megabytes in our most powerful System 76.

In addition to the computer and memory subsystem, MSI Systems include a CRT terminal and high speed character printer. The System 12 and 76 are housed in a compact desk unit.

As with hardware, computer software is not always created equal. Since there are a myriad of programs available, MSI offers a choice of Operating Systems for use with your MSI Computer System. Of course, our favorite is MSIDOS, but we offer the powerful SDOS and FLEX operating systems as well. All MSI Systems will support the other software products associated with each operating system.

MSI also has a variety of software programs including a complete Accounting Package and a Multi-User Basic program capable of supporting up to four users.

MSI Systems are currently being used in a broad spectrum of personal, scientific, educational, professional, industrial

control, and business situations. In addition to our Systems, MSI can supply you with individual components for personal and OEM use. All MSI System components are available, some in kit form.

Write or call us for more information about MSI Systems and products and the name of your nearest MSI dealer.

Midwest Scientific Instruments

220 W. Cedar
(913) 764-3273
TWX 910 749 6403 (MSI OLAT)
TELEX 42525 (MSI A OLAT)